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USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

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USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

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PORTNOY, S.L. and ANKUDINOV, D.R.

[Abstract] Energy losses in TDMA satellite circuits are investigated on the basis of the model of a Gaussian memoryless channel incorporating a signal-code construction. The signal-code construction is a consolidated two-stage construction with a modulation system as the inner stage and correcting codes as the outer stage. Signal-code constructions employing Gray codes, cascade codes and M-ary block codes are considered. Real TDMA systems are analyzed on the assumptions that the calculations are made using an audio-frequency equivalent of the circuit, the relay carries a single trunk, the timing and carrier frequency synchronization is ideal, the signal is transmitted in the continuous stream, and there is no noise at the input of the receiving filter. The effectiveness of a signal-code construction employing cascade codes on a real satellite link incorporating MDVU-40 equipment is modeled. The method can be used to select the signal-code construction in a communications channel for the required data rate, and to maximize the energy gain and attainable transmission rate over the relay trunk. It is found that imperfections in the carrier and timing synchronization schemes introduce a strong component in the energy losses on the communications line. The method can easily be modified to allow for the influence of the synchronization circuits, and to match the decoder algorithm to the synchronization circuit. Figures 4; references 8: 6 Russian, 1 U.S. and 1 Japanese (in Russian translation). [46-6900]

UDC: 621.395.75:621.396.9

SATELLITE CHANNELS IN PACKET-SWITCHING NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 5 Oct 83) pp 9-11

GORSKIY, V.A. and GRIGOR'YEVA, M.A.

[Abstract] The separate and combined use of terrestrial and satellite channels in computer communications networks is examined for varying traffic loads and for different communications system parameters. The division of traffic loads and for different communications system parameters. The division of traffic between the terrestrial and satellite legs used to minimize the average packet delivery time through the network is analyzed. The terrestrial leg consists of several repeater sections connected by multichannel transmission circuits. It is found that inclusion of a satellite channel in a system improves system characteristics upon reaching a certain network load threshold, which depends upon the throughput capacity of the terrestrial leg, the number of channels on that leg and the number of legs in the network. When the throughput capacities are the same, the combined use of terrestrial and satellite channels is feasible only for a network load of ρ=0.4-0.5 for single-channel sections and ρ=0.1-0.2 for multichannel sections. If a satellite channel bypasses several repeater sections of the ground leg, the use of the satellite channel becomes feasible even when the network loading is light. If there are more than 5 terrestrial legs, the satellite channel becomes the priority route. References 6: 1 Russian, 5 Western (2 in Russian translation).
[46-6900]

UDC: 621.391.28

SATELLITE BRIDGES IN COMMUNICATIONS NETWORKS

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 12 Jan 83) pp 5-8

ASKINAZI, G.B.

[Abstract] The use of satellite bridges-satellite communication channels set up in a parallel to terrestrial communication links to connect distant nodes directly-is described. The use of local bridges between two nodes, between which traffic is concentrated, is discussed. In a radial network, bridges are set up between the center and network nodes which are less heavily loaded than others. These are called distribution bridges. Bypass bridges are set up in networks in which the load is uniformly distributed among nodes connected by the "each-to-each" principle. By augmenting the parallel terrestrial channels, satellite bridges improve the economic effectiveness of communication networks. Figures 6; references: 3 Russian.
[46-6900]

KINETIC RAYLEIGH-TAYLOR INSTABILITY THEORY IN THE IONOSPHERE NEAR EQUATOR

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 20 Jul 83) pp 679-684

GERSHMAN, B. N. and SHEVCHENKO, Gorkiy State University

[Abstract] A linear theory of Rayleigh-Taylor instability is developed for the ionospheric irregularities associated with F spread based on a kinetic description with a Batnagar-Gross-Crook collision integral. Electrostatic perturbations are examined for the equatorial F region of the ionosphere; formulas are derived for the growth rates with and without collisions. The kinetic approach employed is compared with the quasi-hydrodynamic approach used elsewhere for studying Rayleigh-Taylor instability in the ionosphere. The kinetic method provides more accurate results than those obtained in other studies involved with small-scale irregularities. Figures 1; references 11: 3 Russian, 8 Western.
[26-6900]

UDC: 533.9.01

EXITATION OF LOW-FREQUENCY RESONANCE WAVES BY MOVING CONDUCTOR IN SPACE PLASMA

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 1 Aug 83) pp 685-689

ABRAMOVICH, B. S. and NEMTSOV, B. Ye., Scientific-Research Radio Physics Institute

[Abstract] The excitation of low-frequency resonance waves as a conductor is moved along a magnetic field is investigated. A thin ideal cylindrical conductor moving in a plasma along a constant magnetic field is examined. It is demonstrated that plasma oscillations can be generated effectively at the lower resonance frequency, causing absolute instability of the oscillations of the current on the conducting body. The threshold of occurrence and the increments of this electron-ion instability are computed, the instability is found to be periodic with large increments. The possibility of low-frequency resonance instability occurring as man-made satellites travel through the upper ionosphere is assessed. The authors express sincere appreciation to V. Ya. Eydman for stimulating discussions and to N. D. Borisov for remarks made during a review of the paper. Figures 1; references 8: 6 Russian, 2 Western.
[26-6900]

UDC: 535.32

SCATTERING OF ELECTROMAGNETIC WAVES BY CHARGED PARTICLES

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 27 Jun 83) pp 726-733

LUSHNIKOV, A. A., MAKSIMENKO, V. V., SIMONOV, A. Ya. and SUTUGIN, A. G., Scientific-Research Physical-Chemical Institute

[Abstract] The behavior of charged dielectric spherical particles in an external electromagnetic field is investigated. The charged-particle model represents a dielectric sphere with freely-moving excess surface charges. The mathematical formulation of the model represented and the thermodynamic properties of a two-dimensional electric gas are investigated. The equation describing the top part is solved using the approximation of chaotic phases, and the position and width of the plasma resonance are computed. The dynamic polarizability is calculated, and the elastic scattering cross section of electromagnetic waves by charged particles is found. The possibilities of detecting plasma resonances in charged particles experimentally are discussed. It is found that an excess charge on a particle in the plasma resonance region can cause a significant increase in the elastic scattering cross section of electromagnetic waves. Figures 2; references 6: 1 Russian, 5 Western.
[26-6900]

UDC: 538.566

DIFFRACTION OF PLANE TM-WAVE ON CONTINUOUSLY IRREGULAR ELLIPTICAL PLASMA CYLINDER

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 4 Jul 83) pp 770-774

MOROZ, A. V.

[Abstract] The problem of the diffraction of a plane TM-wave on a continuously irregular elliptical plasma cylinder is investigated. The two-dimensional problem of plane-wave diffraction is investigated, with the task of finding the scattering amplitude. The scattering amplitude in the far zone is found by integrating the geometric optical field with respect to the two-dimensional "volume" of the irregularity. This approach, which makes it possible to examine the case of strong irregularities, is called the modified Born approximation. Numerical calculations are cited which illustrate the influence of asymmetry of the elliptical cylinder on the scattering pattern. The author thanks Z. I. Feyzulin for direction of the work. Figures 3; references 8: 7 Russian, 1 Western.
[26-6900]

UDC: 621.391.26

MOVING TARGET DETECTION

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 12 Sep 83) pp 11-15

FROLUSHKIN, V.M. and NOVOSEL'TSEV, L.Ya.

[Abstract] The synthesis of moving target detectors based on the maximum likelihood criterion is examined for the case of unknown amplitude, initial phase and Doppler frequency of the valid signal and unknown covariation matrix of the interfering input. The interference covariation matrix allows for cross-correlation of the processes in the quadrature channels. The structure of these detectors is multichannel with respect to Doppler frequency; the detectors provide a frequency interval indication while operating. The signal detection rules constructed can be used for detecting moving objects, as well as for receiving porthogonal signals by correlation observations; one of the rules is an extension of the familiar optimal procedure for detecting signals by independent observations which regulates the threshold comparison of the ratio of the sum of the squares of the estimates of the mathematical expectations of the random processes in the quadrature channels to the dispersion estimate. References 11: 8 Russian (including 2 concerned with foreign electronics), 3 Western.
[8-6900]

KAM-250 ANTENNA SWITCH

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 p 57

LOZINSKIY, V.M. and OBIKHVOST, N.M.

[Abstract] This article describes the KAM-250 antenna switch, which is designed for switching antennas and short-wave transmitters with a power of less than 250 kW working into 300-ohm balanced feeders. The frequency range of the switch is 3-27 MHz. Automatic grounding of non-working leads is provided. There are four versions of this device which differ in the number of lead-ins and the type of control. The switch is built as a 750 x 1980 x 1320 mm finished rack; the racks can be employed as stand-alone switches, or can be ganged to produce switches with different capacities. Figures 2.
[46-6900]

UDC 621.396.96

PROCESSING OF SIGNALS IN EXPERIMENTS WITH SCATTERING OF SHORT RADIO PULSES BY CONDUCTING SPHERE

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 14 Jul 83) pp 64-66

KOSTYLEV, A.A.

[Abstract] Two algorithms of signal processing in radar experiments with radio pulse scattering are constructed, one for obtaining the pulse response characteristic and one for obtaining the frequency characteristic by means of transient probing signals, with a conducting sphere used as a scatterer so as to eliminate the dependence of both backscattering characteristics on the aspect ratio. Each algorithm evaluates the discrete analog of the respective characteristic. The corresponding equation for the pulse response characteristic, specifically considered here, contains an ill-conditioned matrix and must be regularized with some positive-definite matrix before it can be solved as a variational problem for the point estimate with error minimization. Replacing the linear convolution with a cyclic one results in a faster algorithm, especially with the use of fast Fourier transforms. A ridge estimate can be similarly obtained for the frequency characteristic. The author thanks B.A. Stryukov for assistance in the experiment and L.Yu. Astanin for helpful discussion of the results. Figures 2; references 8: 5 Russian, 3 Western (2 in Russian translation).
[73-2415]

UDC 681.7.068

MULTIFUNCTIONAL ELEMENTS FOR INTEGRATED OPTICS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 17 Jan 84) pp 37-40

VOL'MAN, V.I. and KOZYREV, N.D.

[Abstract] The feasibility of producing universal elements and thus minimizing the number of standard components for integrated optics is theoretically examined. A typical such element would be a wafer of an optically transparent material with an externally voltage-controllable refractive index. Parallel conducting strips are deposited on both surfaces of the wafer so as to form two orthogonal arrays of electrode pairs. Application of appropriate voltages will produce any desired distribution of the refractive index, a generally three-dimensional one and in this particular configuration a two-dimensional one, characterized by the amplitude distribution $u(x,y)$ and the phase distribution $v(x,y)$ in the plane of the wafer. Considering that the refractive index of an only weakly nonhomogeneous medium is a purely real quantity, the first-order partial differential equation constraining the distribution of the refractive index yields the phase distribution $v(x,y)$ when the amplitude

distribution u(x,y) is known. The corresponding boundary-value problem is solved here for two practical cases which admit a solution in closed form, namely where $\mu = F(\mu)$ with argument $\mu=\phi(x)\psi(y)$ and $\mu=\phi(x)+\psi(y)$, respectively. Figures 1; references 6: 4 Russian, 2 Western (1 in Russian translation). [73-2415]

UDC: 629.7.054.07:389.14

COORDINATE DETERMINATION ERRORS IN MEASURING CHARACTERISTICS OF RADIATION FIELD OF AIRBORNE ANTENNAS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 54-56

GAZAZYAN, E.D. and PANCHENKO, V.G.

[Abstract] Expressions are derived for estimating the coordinate errors in measuring the characteristics of the radiation field of airborne antennas. Errors in six coordinates must be taken into account at any given moment: the azimuth, elevation, slant range, heading, pitch and roll of the aircraft. It is recommended that straight-line flights be employed. Maneuvers should be used only in extreme cases, such as for measurements in the upper hemisphere. Conditions are specified under which it is possible to measure the characteristics of airborne antennas not equipped with maneuvering sensors, recording means or telemetry. Figures 1; references: 1 Russian. [88-6900]

UDC: 621.317.743

REDUCTION OF AMPLITUDE-PHASE DISTORTIONS OF MOVABLE MICROWAVE COUPLING CIRCUIT FOR ANTENNA FIELD MEASUREMENTS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 56-57

LETUNOV, L.A. and SKOROV, V.G.

[Abstract] A radio holography system for measuring the amplitude-phase distribution of antenna fields in the aperature is described. The system incorporates a movable microwave coupling circuit between the amplitude-phase meter and the scanning probe which is designed to prevent the amplitude-phase distortions of the microwave circuit from influencing the measurement results. This is achieved by determining the instability of the electrical length of the circuit at every moment and accordingly correcting the measurement results by computer. The block diagram of the system is presented, and the transformation of the signal as it passes through the system is analyzed. In order to reduce errors caused by signals reflected from the metal surfaces of the microwave devices, all metal members of the scanner are coated with an absorbing material. By doing this, the total error resulting from the added microwave devices does not exceed a few tenths of a degree in phase, and approximately 0.1 dB in amplitude. Figure 1; references: 1 Russian. [88-6900]

UDC: 77.021.137:535.37

LUMINESCENCE PHOTOGRAPHY

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 29, No 4, Jul-Aug 84 pp 307-315

NAZAROV, V. B. and ALFIMOV, M. V.

[Abstract] The development of luminescence photography is traced briefly, and descriptions are given of the photographic process and the principles underlying luminescence photography. It is found that luminescence photography has certain advantages over other types of photography, including the possibility of recording an image on luminescent material so that it cannot be seen under natural light, but can be read out through a luminescent means. This property can be exploited for marking articles and for placing sound tracks on movie film. Luminescence photography can be used to record latent images without using chemical intensification. The use of luminescence photography is determined to a significant extent by the performance of the reproducing equipment. Figures 7; references 21: 17 Russian, 4 Western.
[22-6900]

UDC: 788.534.83(088.8)

SYSTEM FOR STABILIZING RATE OF FILM MOVEMENT IN HIGH SPEED MOVIE CAMERA

Moscow ZHURNAL NAUCHNOY I PRIKLADNOY FOTOGRAFII I KINEMATOGRAFII in Russian Vol 29, No 4, Jul-Aug 84 (manuscript received 6 May 1984; after revision 19 Nov 82) pp 241-243

KLYUKOV, Yu. M., Kazan Aviation Institute

[Abstract] A system for controlling film movement at a stabilized rate in a high speed movie camera is described. The use of three motors with a switching device makes it possible to bring the film up to speed with minimum waste. The contrll system is implemented with microcircuits. Figures 2; references: 3 Russian.
[22-6900]

MODIFIED SIGNAL-1 DEVICE FOR REMOTE CONTROL OF TOYS AND MODELS

Moscow RADIO in Russian No 6, Jun 84 pp 50-51

BORISOV, V. and PROSKURIN, A., Moscow

[Abstract] An updated version of the Signal-1 remote controller produced by the Kiev "Kristall" Production Association imeni Lenin Komsomal is described. A silicon transistor replaces the germanium components used in the old version. This improves the performance of the equipment by stabilizing the operating frequency of the transmitter when the ambient temperature changes. The receiver is also twice as sensitive as the old one, which has made it possible to increase the range without increasing the transmitter power. The electromagnetic relay in the receiver has been replaced with a transistor, which is employed as an electronic switch. This makes the output stage of the receiver more reliable. The circuit diagram of the device is traced and analyzed. Figures 3.
[21-6900]

UNUSUAL ELECTRONIC MUSICAL INSTRUMENT

Moscow RADIO in Russian No 7, Jul 84 p 33

SERGEYEV, B., Moscow

[Abstract] An unusual electronic musical instrument is described which utilizes the well known principle of a multivibrator and operates with either a flash-light battery or a biovoltage (A. Aristov, RADIO No 4, Apr 79). Two transistors and the passive elements are connected into an asymmetric multivibrator circuit, oscillations being excited by feedback from the collector of the second transistor to the base of the first transistor through a capacitor. The first one is an n-p-n silicon high-frequency transistor (MP37, MP38, or possibly KT316A), the second one is a p-n-p silicon power transistor (MP42B or GT402A). The load is a loudspeaker with an audio-frequency coil whose d.c. resistance is 10 ohm. The multivibrator is triggered by application of a constant bias voltage to the base of the first transistor relative to its emitter potential. This is done either by closing the switch to the battery or by putting a finger across the two sensors-electrodes. The tonality of the generated sound depends on the resistance of the skin, which can vary over an immensely wide range from person to person. Therefore, a variable resistor in the base circuit of the first transistor serves to tune the instrument to match any given player. The loudspeaker is rates for 1 W power. Other components, in addition to the feedback capacitor and the variable resistor, are three fixed resistors in the two base circuits and a toggle switch. Current from the battery is drawn only when both sensors-electrodes touch; the battery can thus last for 40-50 hours.
[72-2415]

TRANSCEIVER MIXERS

Moscow RADIO in Russian No 7, Jul 84 pp 18-19

PROKOF'YEV, V., RA3ACE, Moscow

[Abstract] A distinguishing feature of transceiver mixers is that the same active element operate in the transmitter mode and in the receiver mode, with the signal applied to the respective input stages. A high-frequency mixer of this type has been built using KP350 or KP306 two-gate transistors in the common-base circuit with two antiphasal inputs and one cophasal input. It operates in a heterodyne into a doubly-tuned tank circuit. Such a mixer with KP350B transistors is used in double-sideband transceiver for mixing the 123 MHz heterodyne frequency with the 21 MHz local oscillator frequency to a 144 MHz intermediate frequency. In the transmitter mode it acts here as a balanced modulator and in the receiver mode it acts here as a synchronous detector, with the low-frequency signal picked off an output transformer. The carrier-frequency signal is suppressed by approximately 30 dB or 45 dB under a fluctuating 15±10% V supply voltage or a stabilized 15V supply voltage, respectively. Figures 2.
[75-2415]

ATTACHMENT TO AUTOMATIC TELEGRAPH KEY

Moscow RADIO in Russian No 7, Jul 84 pp 19-20

GURZHUYENKO, I., UA3ARB, and SOLOV'YEV, D., UA3ANY

[Abstract] An attachment to an automatic telegraph key is described which generates a code for the letter "K" signifying "end of message". It operates together with a TTL electronic telegraph switch. It can also operate with other switches, but then requires a matching input device. It consists essentially of two pairs of DD-triggers using any diodes and a low-noise n-p-n silicon transistor whose state they control, the transistor being either turned off or turned on by logic "0" or logic "1", respectively, at the output of the first trigger pair and logic "1" or logic "0" correspondingly at the output of the second one. The triggers are built with series K155 microcircuits, replaceable with series K131 or K158 microcircuits and on a different printed-circuit board with series K130, K133, or K134 microcircuits. Discrete passive circuit components in this attachment include MLT-0.25 resistors, KLS capacitors, and a K1-RES-15 relay for the particular supply voltage. Figures 3.
[75-2415]

NINE-BAND TRANSCEIVER

Moscow RADIO in Russian No 7, Jul 84 pp 20-21

MEDINETS, Yu., UB5UG, Kiev

[Abstract] A nine-band transceiver has been built on a chassis made, along with most of the structural hardware, of AMgSm aluminum alloy. The tuning disks, one for each band mounted on interchangeable trays, are made of laminated glass-Textolite. The circular tracks are cleaned with fine emery cloth, whereupon 1-mm wide foil strips are cut and joined at one end with a jumper foil so as to prevent jamming under contact. The tracks are then covered with graphite for lubrication and the scale divisions are aligned under the window in the cover plate. All transceiver components are mounted on bilaterally metal-clad printed-circuit boards: the transformer and the coaxial resonators on the nonconducting side, all other components on the conducting side. For alignment and tuneup of the transceiver are needed a receiver with a precise scale covering all the short-wave bands and adapters for the UHF bands, two generators of standard signals G4-102 and G4-104, two other signal generators for 430 MHz and 1215 MHz, respectively, resonance-type wavemeters for the 30-1300 MHz range, and a high-frequency voltmeter. The procedure is greatly facilitated when an electronic frequency meter and a pectrum analyzer are available for determining the amplitude-frequency characteristics. After the transceiver without SW and UHF plug-in modules has been checked for shorts in the power supply circuit and found to have none, it is tuned with a rotary capacitor to the frequency of a reference heterodyne, 24,003-24,004 kHz, corresponding to the lower sideband, and then the frequency of both is shifted in tune downward by 1 kHz. The short-wave module and the UHF module are each checked for shorts in the power supply circuit and then each separately plugged into the transceiver for tuning in the receiver mode of operation, first with a signal from the appropriate generator of standard signals and then with a signal picked up from the air by an antenna. The automatic gain control is also checked while the transceiver is connected to the antenna. For checking the transceiver in the transmitter mode of operation, the antenna is replaced with a dummy equivalent. The author thanks V. Shtamberskiy. OK1AXD, for assistance in developing this transceiver. [75-2415]

STEREO DECODER WITHOUT SUBCARRIER RESTORATION

Moscow RADIO in Russian No 7, Jul 84 pp 22-24

POROKHNYUK, A., Leningrad

[Abstract] A stereo decoder is described which includes automatic phase-lock frequency control in the shaper of switching pulses and does not require restoring the spectrum of polarity-modulated oscillations. This eliminates the need for restoring the subcarrier-frequency signal to detection level and the need for compensating amplitude and phase distortions of the ultrasonic component in the spectrum of the complex stereo signal. The gist of this innovation is that the complex stereo signal proceeds from the FM detector to a proportionally differentiating filter and, after conversion in the latter, is demodulated by two synchronous detectors. The switching pulses necessary for synchronous detection are produced by a pulse shaper consisting of an oscillator with automatic phase-lock frequency control and a band-pass filter for the synchronizing voltage. Automatic control is provided by a paraphrase amplifier-limiter with one transistor and diode-diode logic shaping the signal which triggers a push-pull phase detector. The output signal from this detector proceeds through a low-pass filter to a voltage-controlled multivibrator oscillator built with diode-diode logic. A counter with DD-triggers divides the frequency of the multivibrator output signal by 4 and puts out four voltage signals in phase quadrature. The 90°-270° pair of voltages proceeds to the phase-lock frequency control detector. The 0°-180° pair of voltages proceeds to the detector in the automation loop. The output signal from this latter detector passes through a proportionally integrating RC filter with operational amplifier and then through a single-transistor threshold device to a single-transistor d.c. amplifier. The presence of a stereo signal is indicated by a light-emitting diode. This stereo decoder is mounted on two printed-circuit boards, the automatic phase-lock frequency control on one and the decoder itself on the other. Its alignment and tuneup are relatively simple, inasmuch as only a few components need to be adjusted. Each module should be checked out separately, the decoder itself first. When the voltage cannot be reduced to near zero during alignment, it is likely because the voltage-controlled multivibrator oscillator cannot start and the triggering capacitor must be increased. Figures 4; references: 3 Russian. [75-2415]

UDC: 389.14:543-14.08:66:535.853.36

IV-10P MOISTURE METER FOR MOTION PICTURE MATERIALS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 60-61

GROSS, L.G., IVANOV, V.P., SINEL'NIKOVA, E.S., PUSHKAREV, V.V. MAKAROV, A.N., PETROV, Ya.A. and KOCHKINA, V.D.

[Abstract] This article describes the IV-10P infrared moisture meter for motion picture photographic materials. The device is designed for continuous contactless measurement and monitoring of the moisture content of light sensitive photographic, film and other sheet materials which are relatively transparent in the near-infrared region of the spectrum. The device can operate at temperatures ranging from 10 - 40 C and relative ambient humidity of up to 80%. The IV-10P employs absorption of moisture by infrared radiation passing through the material being tested. The meter incorporates a single-beam three-wave optical measurement system. The optical circuit of the device is presented and explained. Figures 2; tables 1; references: 16 Russian.
[88-6900]

UDC 621.391.82

ERROR PROBABILITY DURING OPTIMAL NONCOHERENT RECEPTION OF BINARY SIGNALS IN MULTIBEAM CHANNEL

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 3 Oct 83) pp 48-50

FOMIN, A.I., SERDYUKOV, P.N. and MEZHEVICH, V.V.

[Abstract] A general expression is derived for the terror probability during noncoherent reception of discrete signals in channels with both fast and slow fading. The fast fading is approximated with an m-distribution (m_1 corresponds to a Rayleigh distribution) and the slow fading is assumed to have a log normal distribution, the latter also readily approximated with an m-distribution. Fading modifies the error probability $P= 0.5e^{-\frac{1}{2}h^2}$ ($h^2= P_sT/N_0$, P_s- signal power, T-symbol length, N_0 - spectral density of noise) to $\bar{p}= 0.5\ (2mm_1\ /h_0^2)^m \psi$, where $\psi(m,m-m_1+1,\ 2mm_1/h_0^2)$ is a degenerate hypergeometric function. The error probability is, accordingly, also a function of the approximation error. References: 7 Russian.
[73-2415]

UDC 621.391.019.4

REGULAR SYNTHESIS OF PAIRS OF PHASE-KEYED BINARY MINIMAX SIGNALS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 19 Sep 83) pp 50-53

LUCHANSKAYA, Kh.I. and KHEVROLIN, V.Ya.

[Abstract] A regular method is proposed for synthesizing pairs of phase-keyed binary signals with minimum values of maximum autocorrelation and crosscorrelation peaks. The method is based on the mutual energy spectrum of two code sequences and representation of the corresponding polynomial as the product of two. It involves selection of "+" and "-" signs in one sequence so as to minimize the maximum of the crosscorrelation function and then deriving the second sequence from the first one so as to minimize the side peaks of the autocorrelation function. The method is demonstrated on pairs of Barker sequences, of M-sequences, and of sequences which with any given autocorrelation function have the minimax of the crosscorrelation function. The method yields a smaller minimax than the Gold method, only very long sequences obtained by both methods have similar characteristics. Tables 3; references 4: 3 Russian, 1 Western.
[73-2415]

UDC 621.372.8

INTERFERENCE IMMUNITY OF FIBER-OPTIC COMMUNICATION LINES WITH SPECTRAL MULTIPLEXING OF CHANNELS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 4 Jul 83) pp 71-74

PETROSYAN, A.Kh. and NSHANYAN, M.A.

[Abstract] The performance of fiber-optic communication lines with spectral multiplexing of channels is analyzed from the standpoint of interference immunity and its improvement. The major sources of interference and insertion losses are crossovers, which generate crosstalk, and demultiplexers in the receiver. The signal intensity at the output of the j-th demultiplexer for the i-th spectral channel is calculated first, assuming independant signal sources. Then the ratio of peak signal power to average interference power is calculated, taking into account quantum noise, thermal and shot noise, mode beats, and background illumination. A demultiplexer is designed on this basis, but optimization of the channels is an indeterminate problem whose solution depends not only on the optimality criterion but also on the given values of the other interference indicators not selected as optimality criterion. The interference immunity of such communication lines can be improved by post-detector compensation of crosstalk, which requires only a multipole network with appropriate "j-th input to i-th output" transmission coefficients, and by taking into consideration that the interference immunity will decrease as the useful signal bandwidth increases. The authors thank A.G. Muradyan for helpful discussion. Figures 2; references 3: 1 Russian, 2 Western.
[73-2415]

UDC 681.7.068/069:621.396.22.029.7

AL-124 LIGHT-EMITTING DIODE IN 30 Mbit/s FIBER-OPTIC COMMUNICATION LINE

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 10 Aug 83) pp 77-79

VILISOV, A.A., GORBATOV, N.A., MARCHENKO, S.N. and CHAPLYGIN, V.A.

[Abstract] An experimental study was made with an AL-124 light-emitting diode as a transmitter for a high-speed fiber-optic communication line, this diode having a power rating of 4 mW in the 870 nm wavelength band at a 100 mA pumping current and a 2 V forward bias. A quartz-polymer fiber with a core diameter of 200 μm, a numerical aperature slighly larger than 0.2, and an attenuation coefficient of 40 dB/km was used as a multimode light guide. The electric power supply in the transmitter stage consisted of a TTL gate built with series 530LA-16/17 microcircuits on the diode "-" side and a capacitance-resistance-capacitance Π-network (300 pF leading shunt capacitor, 15 ohm series resistor, 1500 pF shunt capacitor in parallel with trimming capacitor) on the diode "+" side. Light pulses with rise time and fall time not exceeding 20 ns are generated by an AL124 diode upon excitation producing the necessary voltage drop across it. In the experiment this excitation was provided by an electric pulse signal through the TTL gate. The results indicate that the performance of an Al-124 light-emitting diode is adequate for data transmission by a binary pulse-position code at a rate of 30 Mbit/s over fiber-optic lines. Figures 4; references 3: 2 Russian, 1 Western (in Russian translation).
[73-2415]

RADIO KIT 'ELEKTONIKA-10-STEREO'

Moscow RADIO in Russian No 9, Sep 84 p 37

KOLESNIKOV, Yu. and BURSHTEYN, Yu., Vinnitsa

[Abstract] The "Elektronika-10-Stereo" radio kit is the latest of the "Olimp" series, the main improvement being that it also includes the appropriate chassis as well as all necessary mounting and switching hardware. The amplifier has also been updated, both in structural layout and in electrical components. One important modification is that both preamplifier channels are mounted on the same printed-circuit board, which greatly simplifies the assembly. Other features are protection of the loudspeakers against the d.c. voltage component and a built-in time delay for turning on the loudspeakers after the click which follows connection of the amplifier to the power line has died out. The amplifier is furnished with indicators of output power level.

Its characteristics are nominal output power 2x10 W to a 4-ohm load, nominal frequency range 20-20,000 Hz with not more than +1.5 dB nonuniformity of the amplitude-frequency characteristic, maximum ripple factor 1%, sensitivity 1-2 mV at "microphone" input, 20-25 mV at "radio" input, 200-240 mV at "universal" input, depth of low-frequency and high-frequency timber regulation at least ±15 dB. The amplifier operates from a 220 V -50 Hz power line. The kit costs 70 rubles. Figures 1.
[82-2415]

MODERN CASSETTE TAPE RECORDER

Moscow RADIO in Russian No 9, Sep 84 pp 46-49

IZAKSON, I. and SMIRNOV, V., Kiev

[Abstract] The recording-and-playback channel for the latest stereo cassette tape recorders of 2d class and 3d class complexity according to GOST 24863-81 is designed for operation with Fe_2O_3 and CrO_2 tapes. It includes controllable high-frequency predistortion in the recording mode and high-frequency correction in the playback mode for each kind of tape. Switching from one kind of tape to the other and from "record" to "playback" or vice versa is done electronically. The characteristics are operating frequency range 40-14,000 Hz, maximum ripple factor at linear output 0.2%, noise level in playback channel -62 dB with weighting filter, sensitivity 0.08 mV at microphone input and 8 mV at input for all other signals, regulation of high-frequency correction for playback 4-12 dB at 14 kHz, range of automatic sound level control at least 40 dB. maximum output voltage of recording amplifier at least 3.5 V, regulation of high-frequency predistortion for recording 9-20 dB at 14 kHz, magnetizing current at least 1.2 mA, frequency of magnetizing current 70-80 kHz, erasing voltage at least 24 V, crosstalk -40 dB in 250-6300 Hz range, nominal supply voltage 12 V, input current for recording at most 110 mA and for playback at most 20 mA. Figures 2; tables 1; references: 5 Russian.
[82-2415]

TRANSCEIVER WITH QUARTZ FILTER

Moscow RADIO in Russian No 9, Sep 84 pp 19-22

LAPOVOK, Ya., UA1FA, Leningrad

[Abstract] The transceiver described in RADIO No 8, Aug 84 includes a power supply with a transformer, transistor-diode-stabilitron rectifier and RC filter. It is mounted on a chassis with partitions, all made of AMTsP aluminum alloy, with a special compartment for the high-frequency circuits. All transceiver elements, including variable air capacitors and fixed coils on Al-Si-Fe or ferrite cores are specially designed and properly mounted. Alignment and tuneup of the transceiver begins with checking the power supply, which should deliver 39 V to an open circuit and 35 V to a 1 A load when

connected to a 220 V - 50 Hz line. The next step is adjusting the fine-tuning-range heterodyne with a frequency meter and with a thermally compensated capacitor. The high-frequency channels are checked in two steps, the amplitude-frequency characteristics of amplifiers being checked with an audio signal after their power stages have been checked for nonlinear distortion and appropriately corrected. The entire transceiver is then checked as a transmitter and as a receiver in single-sideband operation and in continuous-wave operation. Spare terminals are provided for connecting SW or UHF adapters. Figures 12; tables 2.
[82-2415]

HORIZONTAL DEFLECTION TS-257

Moscow RADIO in Russian No 9, Sep 84 pp 24-28

KATSNEL'SON, N. and SHPIL'MAN, Ye., Minsk

[Abstract] The MRK-1 radio-frequency television channel described in RADIO No 8, Aug 84 includes controls for line and frame sweeps as well as metric-waveband (I-II-III) and decimetric-waveband (IV-V) selectors. The channel characteristics are noise-limited image sensitivity 90 μV in bands I-III and 140 μV in bands IV-V, maximum residual frequency deviation after automatic tuning of the heterodynes ±75 kHz, effectiveness of automatic gain control 3 dB over the 0.1-50 mV range of input signals, maximum input signal capacity at least 87 mV, spread of video output signal from sync pulse level to white level at least 2 V, audio signal voltage at least 180 mV. The metric-waveband selector consists of separate r-f amplifiers and heterodynes for each of the three frequency bands, in addition to a high-pass ladder filter, a mixer, an intermediate-frequency stage, and an automatic gain control common for all. Each r-f amplifier has two transistors with a two-section band-pass filter in the collector circuit. Each heterodyne has two transistors in a Hartley oscillator circuit with capacitive feedback. The mixer has one transistor connected to three band-pass filters through coils and switching diodes. The decimetric-waveband selector (470-790 MHz) is coupled on its output side through a matching resistor and a switching diode to the mixer of the metric-waveband selector. Its input stage is a fixed high-pass filter and has a capacitor which partially compensates the input inductance of the r-f amplifier transistors. This filter is built with half-wavelength line segments shorted by capacitors at one end and terminating into varicaps at the other end. Both selectors are mounted in a micropack together with other r-f channel components. Those include an i-f image filter on surface acoustic waves with an interdigital transducer and a K174UR5 microcircuit, a two-stage transistor amplifier which compensates the attenuation of i-f signals in the filter, automatic frequency trim for the heterodynes, synchronous detectors for video signals, an amplifier-limiter and a phase detector for audio signals from the SAW filter in the sound track. Figures 6.
[82-2415]

RADIO RECORD PLAYER 'RADIOTEKHNIKA-101-STEREO'

Moscow RADIO in Russian No 9, Sep 84 pp 29-32

PAPUSH, V. and SNESAR', V., Riga

[Abstract] The "Radiotekhnika-U-101-Stereo" set includes a high-fidelity amplifier of audio-frequency signals, those generated in other stages of the set and those coming from external program transmitters. Its characteristics are nominal output power 2x20 W, nominal frequency range 20-20,000 Hz, nominal input voltage 2 mW for sound pickup and 200 mV for all other components, ripple factor 0.3 over nominal frequency range, signal-to-hum ratio 60 dB. weighted signal-to-noise ratio 83 dB at 50 mW output power, output voltage for connecting stereotelephone sets (load resistance 16 ohm) 0.9 V, input power 80 W, size 430x330x80 mm, weight 10 kg. The amplifier is furnished with an electronic switch for its two input stages, an overload protection for both input stages, as overheat protection for the transistors in the output stage, two electronic indicators of output power level, one for each channel, with two-color cathodoluminescent display, and protection of the two loudspeakers against the d.c. voltage component passing through in the case of amplifier faults. The "Radiotekhnika-EP101-Stereo" record player is based on the IEPU-70S-02, playback device with a GZM-105D magnetic head and includes two other components, namely a preamplifier-corrector and a motor input voltage stabilizer, in addition to precision speed control for the turntable with a built-in stroboscope, an electromagnetic microlift and an automatic return mechanism for the pickup arm. Its characteristics are turntable speeds 33.33/45.11 rpm, crackle factor 0.15, relative rumble -60 dB with weighting filter, electrical phon -60dB, operating frequency range 31.5-18,000 Hz, sensitivity of pickup arm 0.7-1.7 mV·s/cm, input voltage 250 mV, input power 25 W, crosstalk attenuation 20 dB at 1000 Hz, force on pickup arm 15±3 mN, size 430x330x160 mm, weight 10 kg. Two transistor switches shunting the amplifier output protect the record player against interference during transients, they close when the power is turned on and open after a short time delay. Figures 9; tables 2.
[82-2415]

UDC: 621.375.54.061

THEORY OF OPTIMUM M-FILTRATION OF SIGNALS AGAINST BACKGROUND OF CORRELATED INTERFERENCE

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 27, No 7, Jul 84 (manuscript received after revision 14 Nov 83) pp 15-19

GOLIKOV, V. S. and KRAVCHENKO, N. I.

[Abstract] A theory is developed for the synthesis of detectors for signals against a background of correlated interference. Neumann-Pearson signal extraction against the background of additive normal interference employing linear discrete M-filters is examined. The impulse response of the optimal filter is shown to depend upon the type of valid signal and the M-correlation function of interference. The problem of noise tolerance of ordinary and optimum linear M-filters is considered for the case of additive normal correlated reference, and the energy signal-to-interference ratios are compared. References: 5 Russian.
[8-6900]

UDC: 621.391.81

DISPERSION OF PHASE-SHIFT KEYED SIGNAL SYSTEMS WITH FIXED NUMBER OF BLOCKS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 27, No 7, Jul 84 (manuscript received 3 May 83) pp 32-36

MITSEL'MAGER, E. Ye. and MUKHAMEDYAROV, R. D.

[Abstract] An exact formula is derived for the dispersion of signal systems with a fixed number of blocks; it is proved that signal systems with M* blocks have the least dispersion. It is also proved that the dispersion of signal systems with least number of blocks becomes smaller as the quantity $[M-M_0]$ decreases, where $M_0=(N+1)/2$ and N = number of elements in signal. The results of calculating the dispersions for several signals systems are presented. It is concluded that the dispersion of signal systems increases near-expotentially as the figure $[M-M_0]$ increases. Tables 1; references: 5 Russian.
[8-6900]

UDC: 621.372.54:621.391.3

NOISE TOLERANCE OF DIGITAL DEMODULATOR FOR COMPLEX SIGNAL SYSTEM EMPLOYING BINARY QUANTIZATION

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 5 Nov 83) pp 46-49

BESSALOV, A. V.

[Abstract] An approximate expression is derived for the error probability during ditital correlation processing of a system of m orthogonal (or quasi-orthogonal) systems. In order to simplify the structure of the digital demodulator, binary quantization is considered. The noise tolerance of non-linear digital and linear analog demodulators is compared for Gaussian and incoherent harmonic interference. Experimental error probabilities which agree well with the theory are obtained by computer modeling of the demodulator. It is found that a nonlinear demodulator employing binary quantization can be improved by adding variable quantizer thresholds. Figures 2; references: 4 Russian.
[8-6900]

UDC: 621.396.96

ANALYSIS OF CHARACTERISTICS OF DIGITAL DISCRIMINATORS FOR PHASE-SHIFT KEYED SIGNALS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 6 Dec 83) pp 49-54

[Abstract] The discrimination and fluctuation characteristics of digital discriminators employed in circuits which track the time position of phase-shift keyed signals are analyzed. The nature of the error signal probability distribution at the discriminator output is examined. Expressions are derived for the discrimination and fluctuation characteristics of a digital time discriminator with the assumption that the random quantities at the imputs to the subtractor are independent of one another. The mean square equivalent fluctuations, referred to the discriminator input, are plotted for convenience in comparing different types of discriminators. Figures 5; references 6: 4 Russian, 2 Western.
[8-6900]

UDC: 621.391.266

COMBINED PROCESSING METHOD AND MATCHED FILTER FOR DISCRETE COMPOSITE FREQUENCY PHASE-SHIFT KEYED SIGNAL

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 21 Nov 83) pp 61-63

BELYAYEV, V. S.

[Abstract] A combined method is proposed for processing complex signals with large bases. An expression is derived for the complex frequency response of the matched filter for a discrete composite frequency phase-shift keyed signal. A matched filter is designed which consists of N frequency channels with different signal delays in each channel and a block in each channel, or a common block, for optimum processing of the phase-shift keyed signal. In the combined processing method, a signal is first processed by a radio-frequency matched filter, after which RF filters filter off the component frequencies of the signal for the individual channels and combine them temporally by means of a multitap ultrasonic quartz delay line. The phase-shift keyed signal is then translated to the video region by synchronous detection and mixing. The pseudorandom coding combination which is extracted is processed in video-frequency matched filters. Tests on an experimental filter show that the theoretical conclusions are valid, and confirm the possibility of using complex signals and combined filters for processing them in communications and other radio systems. Figures 1; reference: 1 Russian.
[8-6900]

UDC: 621.372.54

PIEZOELECTRIC FILTER WITH LOW-Q INDUCTANCES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 1 Nov 83) pp 73-75

YERGIYEV, G. N. and IVANITSKIY, A. M.

[Abstract] A passive bridge circuit for a narrow-band filter is investigated in which the Q-factor of the inductance coils depends upon the requirements for the amplitude-frequency characteristic within the effective delay band. Each arm of the bridge circuit contains a quartz resonator in series with an inductance. Formulas are derived for the increase in attenuation of a filter with inductances in comparison with that of a filter without inductances at the same frequency. The use of the formula is demonstrated by designing a filter section with inductances. The experimental and measured amplitude-frequency characteristics agree well. Figures 1; references 4: 3 Russian, 1 Western.
[8-6900]

UDC: 534.86

OPTIMAL SYNTHESIS OF SURFACE ACOUSTIC WAVE FILTERS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 27, No 7, Jul 84 (manuscript received after revision 6 Jun 83) pp 76-78

DASHENKOV, V. M. and RUKHLENKO, A. S.

[Abstract] An optimum method is proposed for synthesizing surface acoustic-wave filters employing nonrecursive digital filter design methods. The method provides an optimum solution for the entire period of the frequency response. The method is tested by designing filters with different bandwidths and with complex frequency responses, such as television filters. The proposed method can be employed for other multiplicative Chebyshev approximation problems in which the solution is represented as the product of fixed and optimized parts. The proposed algorithm makes an allowance for the general case of an alternating fixed function, which expands its area of application. Figures 2; references 6: 3 Russian, 3 Western.
[8-6900]

UDC: 621.37/.39:534

ANALYSIS AND OPTIMIZATION OF PARAMETERS OF FANNED SURFACE ACOUSTIC WAVE TRANSDUCERS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 27, No 7, Jul 84 (manuscript received after revision 19 May 83) pp 79-81

ZIN'KOVSKIY, Yu. F. and NELIN, Ye. A.

[Abstract] The radiation conductance of interdigital surface acoustic-wave transducers employing fan-shaped finger placement is examined. An expression is derived for the active component of the radiation conductance using the approximation of the normal components of the electrical field. The expression derived agrees with the existing formula for the active component of the radiation conductance of a non-apodized SAW filter with an aperture equal to half the width of the acoustic beam emitted by the transducer. Conversion losses are analyzed as a function of the parameters of fanned interdigital transducers. Expressions are derived for the optimum aperture for which center-frequency losses are minimal. The use of fanned SAW filters to realize a given phase-frequency characteristic is promising. Figures 2; references 5: 3 Russian, 2 Western.
[8-6900]

NINE-BAND TRANSCEIVER

Moscow RADIO in Russian No 6, Jun 84 pp 19-23

MEDINETS, Yu. (UB5UG), Kiev

[Abstract] This article, the second of three parts, describes the schematic diagrams of common board, plug-in modules for each short wave band, and a plug-in UHF module. The common board includes a reference oscillator, a diode mixer, a crystal filter employing a differential-bridge circuit, an IF amplifier and the audio-frequency modulator and amplifier. The shortwave modules are similar, differing mainly in the number of stages and tuned circuits. The oscillators and frequency multipliers in the UHF modules are analogous to those in the shortwave modules. Each of these modules contains two additional frequency multipliers. The transceiver is built mainly with old types of transistors and diodes; replacing them with more modern components, especially in the UHF modules, can provide better sensitivity and power. Tables specifying the construction of the inductance coils employed are presented. The remainder of the circuit of the transceiver is to be described in a future article. Figures 3; tables 3.
[21-6900]

HIGH-FREQUENCY CHOKES

Moscow RADIO in Russian No 6, Jun 84 p 23

GREKOV, A., Moscow

[Abstract] The use of correction chokes from tube-type televisions to replace standard chokes with ferrite conductors (type D-0.1, inter alia) in shortwave receiving and transmitting equipment is described. Chokes without ferrite cores can be employed in circuits carrying relatively high voltages, such as the penultimate and the final stages of transmitting equipment. The construction of a home-built 330-μh choke for the board of a Radio-76M2 transceiver is described.
[21-6900]

CODE LOCK WITH MICROCIRCUIT

Moscow RADIO in Russian No 9, Sep 84 p 37

KOROBKA, A. and MAY, I., Karaganda

[Abstract] A code (kodovyy) lock with a microcircuit has been invented which contains only a very few components, unlike most existing ones. Two DD-triggers contol the state of two identical transistors. Only when both transistors are turned on simultaneously will the trinsistor VS1 also be turned on so that the electromagnet YA1 pulls in the bolt and the door opens. This will happen only when a logic "1" appears at the inverted output of the first trigger and at the straight output of the second one, which requires pressing three selected buttons in a certain sequence. Pressing these buttons in any other sequence or accidental pressing of any of the other seven buttons will not activate the triggers and will leave the door closed. After the door has been opened, a button on it resets the contactors so as to return both triggers to their original state. The electromagnet is designed to produce the necessary pull force and sufficient power when under rectified 127 V line voltage, with the neutral wire of the lock circuit always connected to the "-" terminal of the power supply. Reference is made to a figure 6 in another article on page 36. [82-2415]

ALARM CLOCK BUILT WITH SERIES K176 INTEGRATED MICROCIRCUITS

Moscow RADIO in Russian No 7, Jul 84 pp 26-27

ALEKSEYEV, S., Moscow

[Abstract] A method of converting an electronic radio clock into an alarm clock is proposed, the main problem being to convert signals in the 7-bar code displayed on a luminescent panel into signals in a position code for triggering the preset alarm switches. This is most readily done by collecting the double-digit hour signals in a single NOR circuit, decoding double-digit minute signals with a series K176ID1 integrated microcircuit, and using the same decoder with three NAND circuits for converting single-digit hour and minute signals. The indicator lights are, as usual, connected to the outputs of series K176IYe3 or K176IYe4 microcircuits through KT315 transistor switches. The circuitry can be modified appropriately for operation with p-n-p or MOS transistor switches. If series K176ID1 microcircuits are not available, series K155ID1 microcircuits can be connected to the clock through emitter followers with any p-n-p transistors and used for decoding. The buzzer circuit containing an oscillator with a KT315G transistor pair and three DD-trigger stages is activated through two stages of DD-logic when the clock indication coincides with the setting of the alarm switches, the first stage producing a coincidence signal and the second stage allowing the oscillator to start. Four diodes protect the coincidence circuit against overvoltage. The buzzer tone is

chopped by a 1-Hz signal from the K176TYe5 clock microcircuit. The sound emitter, any low-resistance or high-resistance telephone receiver, or earphone, or dynamic playback head is connected to the oscillator through an output transformer and can be turned off by a pushbutton. Instead of those special code converters, one can use additional counters-decoders operating in synchronism with the main ones. Figures 8.
[72-2415]

RECOMMENDATION ON USE OF SERIES K157UL1 MICROCIRCUITS

Moscow RADIO in Russian No 7, Jul 84 pp 43-44

PETROV, K., Kiev

[Abstract] The series K157UL1A/B microcircuits are low-noise two-channel playback preamplifiers for stereo tape recorders (RADIO Nos 5-6, May-Jun 81). The characteristics of the K157UL1A microcircuit are noise voltage $V_{n,in}$= 0.46 uV and noise current $I_{n,in}$= 120 nA referred to the input, in the 20-20,000 Hz frequency range, based on measurements and calculations with the aid of spectral density curves ($V_{n,in}$= $emf_n\sqrt{\Delta f}$ and $I_{n,in}=i_n\sqrt{\Delta f}$). The characteristics of the K157UL1B microcircuit are somewhat worse. The K157UL1A microcircuit can be used in the playback channel only when its transmission coefficient is at least 50, otherwise the preamplifier becomes unstable. Its resistors and capacitors must be selected and matched for necessary gain and time constants at the various tape speeds, in accordance with established norms. This microcircuit can also be considered for use in the recording preamplifier and final amplifier stages. Figures 10.
[75-2415]

UDC 621.391:535.42

SPACE-TIME RESPONSE CHARACTERISTIC OF ACOUSTOOPTIC FILTER FOR COMPRESSION OF LINEARLY FREQUENCY-MODULATED SIGNAL

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 7 Sep 83) pp 74-76

VASIL'YEV, Yu.G.

[Abstract] The performance of an acoustooptic compression filter operating with interaction of a laser beam and a linearly frequency-modulated acoustic wave is evaluated in terms of the space-time response, namely dependence of that response on the deviation of laser beam incidence from the Bragg angle. The field of the light wave in the first diffraction order in the exit plane of such a light modulator is calculated for an incident modulating acoustic signal $S(t)=A(t)\cos\{2\pi[f_0 t+\frac{1}{2}\alpha(t-\frac{1}{2}\tau)^2]\}$, with $A(t)=\begin{cases}1 \text{ at time } 0\leq t\leq\tau\\ 0 \text{ at time } t<0 \text{ and } t>\tau\end{cases}$,

with a rate of change of frequency $\alpha < 0$, and of duration τ corresponding to the sampling period T= L/v (L- aperture of modulator, v- acoustic velocity in modulator), taking into account the change in the optical refractive index produced by the acoustic wave in the sound guide. The resulting space-time response in the focusing plane reveals that deviation from the Bragg angle lowers the amplitude and causes an additional transverse shift in the focusing plane. Accordingly, this deviation determines the wave parameter and the thickness of the modulator necessary for optimal processing of linearly frequency-modulated radio signals. Figures 2; references 7: 6 Russian, 1 Western (in Russian translation).
[73-2415]

UDC 621.372.832

SYNTHESIS OF LOW-PASS FILTERS USING COUPLED LINES WITH UNMATCHED LOADS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 15 Dec 83) pp 67-69

MESHCHANOV, V.P., LOGINOV, V.M. and SHIKOVA, L.V.

[Abstract] Use of coupled nonhomogeneous lines with directionality of the second kind and unmatched loads is proposed for synthesis of microwave low-pass filters, which must have nonperiodic amplitude-frequency characteristics and be electromagnetically compatible with other radioelectronic devices. Two completely symmetric segments of such lines are connected into a chain network with two of the four output arms either open or shorted. The attenuation characteristic of the resulting octupole depends entirely on the scattering coefficients of its component quadrupoles. The wave transmission matrix of this notching line is evaluated on the basis of known relations between coefficients of the scattering matrix and of the transmission matrix, the T_{11} element of the latter matrix being calculated according to Kammler's recurrence relations (IEEE Trans. MTT-17, No 8, 1969). The problem of synthesis for given pass and suppression bands is solved as a problem in nonlinear programming. Numerical results are given for a typical such filter with the optimum amplitude-frequency characteristic. The method can be extended to low-pass filters with the same amplitude-frequency characteristic as reflecting filters but not letting the suppressed signal return to the generator on the input side. Such a filter is synthesized using four identical segments of coupled nonhomogeneous lines, connecting them into a chain network and connecting matched loads on the output side. Figures 3; tables 1; references 7: 4 Russian, 3 Western.
[73-2415]

UDC 621.391

PREFILTRATION IN KALMAN FILTER WITH A PRIORI INDETERMINACY

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 7 Frb 84) pp 53-57

SHELUKHIN, O.I. and ALYAB'YEV, S.P.

[Abstract] A stable nonlinear discrete Kalman filter is synthesized for measurement of objects with a priori indeterminate, and variable, signal and noise distribution. A robust algorithm of prefiltration is used for obtaining stable maximum-likelihood estimates of the state of a dynamic system in the case of non-Gaussian noise. The estimation problem is expressed in the form of a recurrence relation containing a positive-definite symmetric matrix, whereupon the synthesis problem is formulated in terms of a system of corresponding difference equations in which the measurement errors have been converted to Gaussian ones. Figures 3; tables 1; references 4: 2 Russian, 2 Western (1 in Russian translation).
[73-2415]

UDC 621.391.244

DYNAMICS OF ADAPTIVE SIGNAL CORRECTOR

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 15 Oct 83) pp 40-43

LAZAREV, A.M. and SHEVCHENKO, Yu.V.

[Abstract] An adaptive signal corrector in the form of transversal filter used as a delay line with adjustable weight factors at the taps is considered for use in transmission of digital data over frequency-limited channels. A data signal proceeds from such a channel through a synchronous detector and a readout switch to the corrector. The stability of this device and the convergence rate, in the mean-square sense, of its algorithm of pseudosteepest descent are evaluated on the basis of a general analysis applicable to any kind of modulation. The calculations yield the mean-square error at the corrector output and its convergence to a fixed value for a constant adaptation factor within the $0<\mu<1$ range as well as the steady-state error as a function of the number of taps. The results reveal that the convergence rate is not always a monotonically increasing function of the adaptation factor and, when the number of taps is large, reaches its maximum at the optimum value of the adaptation factor. There is also an upper bound for the adaptation factor which corresponds to the stability limit. Figures 2; references 8: 2 Russian, 6 Western (2 in Russian translation).
[73-2415]

UDC 621.376.332

PERFORMANCE OF TIME-POSITION DISCRIMINATOR OF COMPOSITE SIGNAL

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 19 Sep 83) pp 29-33

BOKK, O.F., SAVVINOV, A.M. and KOLESNICHENKO, G.D.

[Abstract] Optimal time-position discrimination involving multiplication of the signal+noise mixture by the time derivative of its video copies. with maximum slope in the range of small deviations, is compared with time-position discrimination involving multiplication of the signal+noise mixture by the difference of its video copies shifted in time symmetrically forward and backward from the instant of readout. In terms of the output signal-to-noise ratio, the advantage of multiplying by the derivative of video copies at time $\tau = 0$ is equal to the advantage of multiplying by the difference of video copies at times $\tau = \pm\tau_k$. As the time shift decreases toward zero, both methods of discrimination become equally efficient but the magnitude of the transmission coefficient decreases sharply. This is demonstrated on a signal with a uniform finite spectrum. Figures 4; references 8: 6 Russian, 2 Western (both in Russian translation).
[73-2415]

UDC 621.391.828

EFFICIENCY OF DIGITAL COMPENSATOR OF STRONG NONGAUSSIAN INTERFERENCE

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 5 Oct 83) pp 33-35

AVDEYEV, V.V., PARSHIN, Yu.N. and MINAYEVA, I.A.

[Abstract] A digital compensator of strong non-Gaussian wideband interference is considered which contains a band limiter, a subtractor, first and second multipliers, and a low-pass filter with a transfer function $K = 1/pT$ as a bridge between the two multipliers. The interference suppression factor of such a compensator is calculated, considering that the phase distribution in the high-frequency region will be the same at all points along the compensator structure only when there is no parasitic phase shift of the voltage in the band limiter and in the second multiplier. The interference suppression factor is, accordingly, inversely proportional to the sine of the phase shift squared. A digital compensator thus ensures a higher stability of phase characteristics than does an analog one. Conversion from analog to digital compensation involves quantization of the orthogonal input signal components as well as of the limiter output signal and time discretization with numerical solution of the resulting difference equation which describes the compensation process. The efficiency of such a compensator has been evaluated by the method of statistical simulation, with either a harmonic oscillation with known phase or an oscillation with phase-keyed pseudorandom M-sequence as a model signal. Figures 4; references 4: 3 Russian, 1 Western.
[73-2415]

UDC 621.396.965.81:681.51

MATHEMATICAL MODEL OF DISCRIMINATOR FOR SIGNALS WITH FLUCTUATIONS AND THERMAL NOISE

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 26 Dec 83) pp 13-17

BINSHTOK, V.B.

[Abstract] A statistical model is constructed for describing an angle discriminator in a radar station with a conical scan and with a digital computer as a data processing base. The model consists of four modules. The first one pertains to the antenna radiation pattern and scanning mode. The second one pertains to the amplitude fluctuations and thermal noise, with a generator of random normal numbers as well as with appropriate multiplications and additions. The third one pertains to passage of signal and interference through a receiver with amplitude detection and automatic gain control. The fourth one pertains to signal filtration and estimation, with a band-pass filter, phase detector, low-pass filter, and strobing device. The amplitude distribution of incoming reflected signals is assumed to be a Rayleigh or quasi-Rayleigh random one, the thermal noise in the receiver is assumed to be a white one with zero mean and unity standard deviation, and the center frequency of the band-pass filter is assumed to be equal to the scan frequency. One can then treat the model as having two channels in quadrature, each containing an inertialess receiver with automatic gain control, and the phase detector as a multiplier of the output sequence from the band-pass filter by a reference sequence of discrete sine waves with zero initial phase and repetition rate equal to the scan frequency. Both the discrimination characteristic and the fluctuation characteristic have been calculated on the basis of this model and its algorithm for signal-to-noise ratios 100 and 10 at the input of a receiver with typical parameters: scan period 1/30 s, signal correlation time 1/20 s, discretization interval 1/120 s, automatic gain control with maximum gain 1.0, attenuation coefficient 5, filter time constant 0.1 s, low-pass filter with time constant 0.3 s, and tank circuit with Q= 5.
The author thanks I.Kh. Rizkin for valuable suggestions and comments.
Figures 3; tables 1; references: 7 Russian.
[73-2415]

UDC 621.396.96

INTERFERENCE IMMUNITY OF BINARY SYSTEMS WITH SECOND-ORDER PHASE-DIFFERENCE MODULATION IN VARIOUS RECEPTION MODES

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 24 Jan 83) pp 3-8

OKUNEV, Yu.B. and FINK, L.M.

[Abstract] Reception of signals with binary second-order phase-difference modulation is analyzed for interference immunity in various channels with Gaussian noise and, on this basis, second-order phase-difference modulation is compared with first-order phase-difference modulation from the demodulator standpoint. In the case of a channel with deterministic or slowly fluctuating parameters and of correspondingly optimum coherent or quasi-coherent reception, the attainable interference immunity is the same for second-order phase-difference modulated signals as for first-order phase-difference modulated ones, even though errors are not bunched in pairs here but distributed over one element. In the case of a channel with random phase and of correspondingly optimum noncoherent reception the attainable interference immunity is higher for second-order phase-difference modulated signals. A channel with random frequency demodulation of first-order phase-difference modulated signals is altogether not feasible in the present state of the art. Two simple demodulators of signals with single second-order phase-difference modulation are proposed for a channel with a widely fluctuating and non a priori estimable random frequency, and an absolutely invariant one with an interference limiting band-pass filter at the input and a relatively invariant one consisting of several parallel autocorrelation demodulators of first-order phase-difference modulated signals. Figures 6; tables 2; references: 7 Russian.
[73-2415]

UDC 621.391.1

IONOSPHERIC DISTORTIONS OF DIGITAL SIGNALS WITH WIDEBAND MODULATION

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 20 Oct 83) pp 8-13

TEPLYAKOV, I.M.

[Abstract] Wideband digital signals for satellite communication systems, either pseudonoise signals with phase keying or coherent signals with frequency-time keying, are analyzed for distortions occurring during their propagation through the ionospheric waveguide and appearing in a coherently scanning receiver. Calculation of phase shifts and energy losses along the signal trajectory, taking into account the phase-frequency characteristic of an ionospheric layer with a frequency-dependent refractive index, reveals that phase distortions of such signals are caused by dispersiveness of the medium and fluctuation of the electron concentration along the path with resulting fluctuation of the signal arrival time. No distortion results, however, from the extra time delay associated with the linear component of the phase-frequency characteristic. As a specific example, an ionospheric layer with a statistically uniform and isotropic refractive index is considered, and a receiver with correlator or matched filter, in which case fluctuation of the signal arrival time can become predominant at low carrier frequencies corresponding to decimetric and metric waves. Figures 1; references 6: 5 Russian, 1 Western.
[73-2415]

UDC: 384.5:621.396.7

ESTIMATION OF COST EFFECTIVENESS OF NEW EQUIPMENT AT RADIO CENTERS

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 8 Jul 82) pp 58-60

MAKAROV, V.V.

[Abstract] Determination of the cost effectiveness of the introduction of new equipment is analyzed. A generalized cost effectiveness indicator is derived in which the effectiveness of introducing new equipment is expressed unambiguously. The influence of introducing new equipment on measuring the radio center profitability is analyzed. It is found that the modification of transmitters to make them more powerful is the most feasible form of introducing new equipment in order to ensure increased profitability. Figures 1; tables 1; references: 3 Russian.
[46-6900]

UDC: 621.376.4

COMPARATIVE ANALYSIS OF NOISE TOLERANCE OF QUASI-COHERENT PHASE SHIFT KEYING SIGNAL DEMODULATORS

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 7 Feb 83) pp 48-50

MARTIROSOV, V.Ye. and BELOUSOV, N.N.

[Abstract] The noise tolerance of quasi-coherent PSK signal demodulators employing phase-locked loops to filter the reference oscillation is analyzed comparatively for the Siforof scheme, the Costas scheme, the reversible Karshin demodulator, the remodulator-comparator scheme and the adaptive demodulator scheme. The phase of reference oscillation in these quasi-coherent demodulators represents a random process, so that the phase error between the received and references signals is also random. It is found that increasing the initial frequency detuning reduces the noise tolerance of quasi-coherent PSK reception. The reversible and remodulation-comparator schemes have the poorest noise tolerance because of their steady-state phase error, which is twice that of the other schemes. When the frequency instability and amplitude of the received signal are high, it is best to use the adaptive demodulated structure. The formulas derived can be used to select the structure for a quasi-coherent PSK signal demodulator according to the required system-wide indicators of the digital transmission system, and to assess its noise tolerance during the design phase. Figures 1; references 11: 7 Russian, 4Western (2 in Russian translation).
[46-6900]

UDC: 621.396.43

OPTIMUM PATH SELECTION IN AUTOMATED RADIO RELAY LINK DESIGN

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 5 Dec 83) pp 15-19

DANILOVICH, O.S. and KICHIGIN, V.N.

[Abstract] This study investigates the selection of the locations of radio relay stations so that the stability of the radio relay link satisfies the corresponding CCIR recommendation, as so that the effective station construction and operation costs are minimized. A methematical model for selecting the optimum radio relay link route is described. The construction of a hypothetical radio relay link 1400-km long with an average repeater section link of 50-km is analyzed as an example. The algorithm is shown to be especially effective for rough terrain where it is often impossible to place the stations close to roads. Figures 3; references: 6 Russian.
[46-6900]

UDC: 621.395.38

CONSTRUCTION CHARACTERISTICS OF SIGNALLING SETS EMPLOYED IN KVARTS QUASI-ELECTRONIC AUTOMATIC LONG-DISTANCE EXCHANGE

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 3 Nov 82, after revision) pp 39-42

ZHARKOV, M.A., NOVIKOVA, O.S., SPINTSIS, A.A. and STANKEVICH, V.I.

[Abstract] The individual (line) and group equipment sets used in the KVARTs quasi-electronic automatic long distance exchange to transmit and receive all functional signals over speech circuits are examined. These sets are centrally controlled from the Neva-1 control complex. By using this approach, the amount of equipment employed in the line and group sets is reduced significantly as compared with the counterpart equipment employed in crossbar exchanges. A structural diagram of quasi-electronic exchange is presented which shows the connection of the individual and group equipment. In contrast to western switching systems, the group sets in the KVARTs exchange are connected to the lines through a common field, rather than a special switching stage. Special devices called scanning points and distribution points are described which control and monitor the operation of the line and group sets. Schematic diagrams of these points are presented, along with diagrams of the circuit which generates galvanic signals and the output section of the voice-signal frequency receiver employed in a line set using single-frequency signalling. Structural diagrams showing the arrangement of electronic pulse repeaters and the connection of the switching circuit test sets are provided. Figures 7; references: 5 Russian.
[46-6900]

UDC: 621.395.344

OPTIMIZATION OF STRUCTURE OF TWO-SECTION CIRCUITS EMPLOYING INTRA-BLOCK BYPASS LINES

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 (manuscript received 15 Jul 81) pp 42-45

BUKEYKHANOV, Ye.S.

[Abstract] The use of bypasses in two-section switching circuits in order to increase throughput capacity and reduce blocking probability is described. The effectiveness of circuits with bypasses is analyzed theoretically and with reference to experience with the Pentaconta system. The effectiveness of increasing the throughput capacity of a two-section circuit with bypasses by adding additional equipment is evaluated. It is found that the use of bypasses is feasible only for a relatively small range of input loads. The effectiveness of modifications to existing automatic exchanges is analyzed with allowance for the additional costs entailed. It is found that the higher the cost of the line equipment, the more economical the implementation of bypasses. Figures 3; references 5: 3 Russian, 2 non-Russian.
[46-6900]

UDC: 621.371.361.1:523.532

CALCULATION OF AMPLITUDE-PHASE CHARACTERISTICS OF SIGNAL SCATTERED OBLIQUELY ON METEOR TRAIL

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 6 Jun 83) pp 1110-1115

KHUZYASHEV, R.G., Kazan State University

[Abstract] Diffraction processes occurring during oblique incidence of a plane radio wave on a cylinder with an irregular radius are investigated for the case of the decaying plasma of a meteor trail. The boundary problem for the differential equation of the functions of the radial coordinate is found and solved by reduction to a Cauchy problem. Expressions are derived for the amplitudes and phases of the reflection H- and E-waves in a cylindrical coordinate system. The behavior of the amplitude and phase of the reflected waves with both polarizations are investigated as a function of the angles θ,ϕ and the normalized radius. It is found that a rigorous solution of the wave equations for oblique incidence makes it possible to calculate the characteristics of the reflected signal more accurately than by the approximate method. Figures 8; tables 1; references 9: 2 Russian, 7 Western (1 in Russian translation)
[97-6900]

UDC: 621.391.814:533.9

DOMAIN OF APPLICABILITY OF ASYMPTOTIC DESCRIPTION OF RADIO PULSE FIELDS NEAR CRITICAL FREQUENCY

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 23 May 83) pp 1130-1135

ORLOV, Yu.I. (deceased) and FEDOROV, N.N., Moscow Power Engineering Institute

[Abstract] Practical bounds for the applicability of asymptotic methods for investigating unsteady fields in the vicinity of the critical frequency are found. Numerical examples are presented to illustrate the validity of the estimates for homogeneous and heterogeneous plasmas. The approximations of the space-time geometric theory of diffraction, and far-zone approximations, are examined for a homogeneous plasma, and then extended to a heterogeneous ionospheric layer. It is found that the applicability of asymptotic descriptions of the pulse envelopes agrees well with the estimates. This method for determining the conditions for the applicability of an asymptotic description of unsteady fields near the critical frequency can be extended to signals with arbitrary amplitude-phase modulation. The authors express their gratitude to Yu.A. Kravtsov and V.A. Permyakov for assistance during proparation of the manuscript. Figures 2; references 10: 7 Russian, 3 Western.
[97-6900]

UDC 621.396.61.019.4

SPECTRA OF INCIDENTAL INTERFERENCE RESULTING FROM NONLINEAR CONVERSION OF SIGNALS FROM TRANSMITTERS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 14 Oct 84) pp 46-47

TELEZHNYY, B.G.

[Abstract] The interference spectrum resulting from nonlinear conversion of signals from n transmitters with single-band modulation, the most common kind of modulation, is evaluated on the basis of a quantitative correlation analysis. The characteristic of the nonlinear converter is approximated with a finite power series $\zeta(t)= f[\xi(t)] = \sum_{k=1}^{m} a_k \xi^k(t)$, where $\xi(t)= \xi_1(t)+...+\xi_n(t)$ is the resultant action of n signals. The correlation function is $B(\tau)= M_{11}(t_1,t_2)-M_1^2(t)$, M are moment functions of process $\zeta(t)$, and the spectral density of process $\zeta(t)$ is $F(\omega)= 2\int_0^\infty B(\tau)\cos\omega\tau d\omega$. With the attendant noise assumed to have a uniform spectral density over the modulation frequency band, process $\xi(t)$ becomes a normal stationary one. The width of the spectrum of incidental interference is then readily calculated for each signal harmonic and any number of signals (transmitters) producing intermodulation interference. Figures 2; references: 3 Russian.
[73-2415]

UDC 621.3.013.001.24

METHOD OF SEPARATELY DETERMINING ELECTROPHYSICAL PROPERTIES OF BULKY CONDUCTOR

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 (manuscript received 31 Aug 83) pp 41-45

STEELEV, Yu.I., candidate of technical sciences, Kuybyshev

[Abstract] A method of determining the electrical conductivity and the magnetic permeability of bulky conductors such as plates or cylinders from field intensity measurements is described, the gist being to explicate each of these two parameters from the readings of electric field intensity and magnetic field intensity at the conductor surface or in a plane of symmetry. The method is based theoretically on Fourier-Bessel integral transformation of the differential field equations for the corresponding conductor medium. The integral relations are then mapped so as to yield the necessary relations between two field functionals and the space distributions of the electromagnetic field components. Further explication and numerical integration yield the ratio of calculated to measured conductivity and permeability. The procedure is demonstrated on a numerical example of a plane-parallel field above a heavy plate. Figures 2; references 6: 5 Russian, 1 Western (in Russian translation).
[79-2415]

UDC: 681.3.00:681.327.8

PROBLEMS OF ORGANIZING NETWORK OF AUTOMATED IMAGE PROCESSING SYSTEMS

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKHNIKA in Russian No 3, May-Jun 84
(manuscript received 17 Oct 83) pp 48-55

SADYKOV, S.S. and KADYROVA, G.Kh.

[Abstract] The structural diagram of a proposed network of automatic image processing systems is presented. The network is comprised of four levels: the first, or lowest level consists of automated image processing terminal systems. The second level represents the set of local automated image processing centers. The third level is made up of the set of regional (and branch) automated image processing centers. On the fourth level are inter-branch automated image processing centers. Estimation of the possible total information volume in the network is discussed, and the functions of the four network levels are described. Figures 1; references 35: 30 Russian, 5 Western (1 in Russian translation)
[76-6900]

UDC 681.324

STABILIZATION OF TRANSMITTERS IN OPTICAL LOCAL COMPUTATIONAL NETWORKS

Riga AVTOMATIKA I VYCHISLITEL'NAYA TEKNIKA in Russian No 3, May-Jun 84
(manuscript received 31 Oct 83) pp 56-60

TIKHOMIROV, S.N. and FINKEL'SHTEYN, E.Ya.

[Abstract] A simple method is proposed for temperature stabilization of the radiated power of injection laser diodes employed in fiber optic communication lines. The method is based on correcting the pumping current of the laser diode, and makes it possible to reduce the temperature fluctuations of the photo current by more than an order of magnitude. The method is effective at temperatures ranging from 10-50°C, corresponding to the most probable operating conditions in local area networks. In contrast to thermostat control of the working body of the laser, the proposed method entails practically no additional energy consumption. Figures 8; references 5 Russian.
[76-6900]

UDC 621.317

SIMULATOR OF 'ELEKTRONIKA-60' MICROCOMPUTER CHANNEL

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 6 Oct 83) pp 61-64

KOMAR, L.I., YAKUBOVICH, V.M. and USACHEV, O.I.

[Abstract] An "Elektronika 60" microcomputer channel simulator which includes an input/output module and generates "common busbar" interfacing signals has been developed for fault location and debugging with use of test data. Its major components are a pulse generator with a pulse distributor and a channel transmitter with a shaper of channel signals. Auxiliary components include two triggers, one for the data busbar and one for the address busbar connected in parallel, a binary counter, and two decoders built with D-type integrated microcircuits and diodes, and a "start" button, a "clear" button, and "input" light-emitting diode, a program switch, and two tumbler switches. One tumbler sets the simulator in OPERATE or CHECK mode and the other tumbler switch sets the data exchange in continuous AUTOMATIC or single CYCLE mode. The simulator can be expanded for handling a large volume of debugging data or for a broader scope of debugging functions. Figures 2; references 2: 1 Russian, 1 Western.
[73-2415]

UDC 621.317.333.8:621.315.624.4.015.51

IMPACT OF STEEP-FRONT LIGHTNING DISCHARGES ON INSULATION OF OVERHEAD ELECTRIC POWER TRANSMISSION LINES

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 (manuscript received 20 Dec 83) pp 13-19

KOLKER, D.G., engineer, Slavyansk

[Abstract] The probability and the intensity of voltage pulses with steep fronts impacting on the insulation of overhead electric power transmission lines following lightning strokes are estimated for various conditions of line impairment. The analysis is based on appropriate theoretical relations and available statistical data. The overvoltage pulse front is calculated for an overhead line with and without protective cable, respectively, by differentiating the fundamental lightning voltage equation with respect to time. The five components of the total voltage appearing across the insulation are a resistive one produced by the voltage drop across the support grounding grid, two inductive ones electrically and magnetically induced by currents in the support and in the lightning channel, an inductive one induced by currents in the protective cable, and the working voltage. Calculations are made for three most common types of lightning impact: on the support, on the cable at midspan, on the conductor after breakdown of protective cable. The results indicate that the pulse fronts at overhead lines with protective cable above high-conductance grounds have slopes not exceeding 1000 kV/μs, their slopes increasing appreciably, however, as the support grounding resistance increases, while at overhead lines without protective cable there is a 50% probability of pulse fronts with slopes exceeding 2000 kV/μs. The average number of lightning strokes affecting one metal support during its service life depends on the voltage class and varies from 14 to 75 at a mean annual rate of 100 lightning hours on 35 kV lines. Dish and pin insulators with structural defects can be reliably detected, by testing, already after 20 pulses with respectively 1000-1500 kV/μs and 2000-2500 kV/μs pulsefronts. Figures 6; tables 3; references 13: 4 Russian, 2 Polish, 7 Western. [79-2415]

UDC: 621.382.2

NOISE CHARACTERISTICS OF SULFUR-DOPED SILICON DIODES

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 13 Feb 84 after revision) pp 1218-1220

MKHITARYAN, Z.O., BARSEGYAN, R.S. and ARUTYUNYAN, V.M., Yrevan State University

[Abstract] This study presents the findings from an experimental investigation of the noise properties of sulfur-doped silicon $p^+ - n - n^+$ structures. The frequency and current characteristics of the noise at 20 Hz-20 KHz and temperatures of 77 and 300 K were measured. The noise was amplified by a preamplifier and a narrowband selective amplifier, and were measured using an S4-48 spectrum analyzer. The silicon was doped with sulfur by diffusion. The noise characteristics were investigated at room temperature in the linear and initial quadratic sections of the voltage-current characteristic. Two plateaus were identified in the noise spectrum at room temperature. It is concluded from the form of the relationship between the spectral density of the current noise and frequency and current passing through the diode that the noise occurring in sulfur-doped silicon structures is generation-recombination noise. The authors thank N.B. Luk'yanchikov for discussion of the results and M.G. Tokhmakhyan for assistance during adjustment of the measuring equipment. Figures 2; references 10: 6 Russian, 4 Western (1 in Russian translation)
[97-6900]

UDC 621.319.7.001.6

ESTIMATING ATTENUATION TIME FOR OSCILLATIONS OF FIBERS DURING ELECTRICAL FLOCCULATION

Moscow ELEKTRICHESTVO in Russian No 9, Sep 84 (manuscript received 9 Sep 83) pp 55-58

SEMENOV, V.A., Leningrad

[Abstract] The attenuation time for oscillations of textile fibers during tensioning by electrical polarization and flocculation, after chemical processing, is estimated on the basis of the statistical characteristics of their orientation in a uniform electrostatic field. The mean-square angle between fiber axis and field direction is selected as a governing parameter. Both length and diameter of the fibers in a bundle are assumed to deviate negligibly from their nominal sizes. The damped oscillation of a fiber between upper and lower flocculator electrodes is calculated from the probability distribution density of fiber orientations and the flocculation frequency. The necessary integration is performed separately for a flocculation frequency lower than, and equal to or higher than critical. The attentuation time has been evaluated numerically for nylon and rayon fibers, assuming a precision cut from materials of uniform linear density. Figures 4; references 10: 9 Russian, 1 Western.
[74-2415]

UDC 621.317

MEASUREMENT OF INTERNAL THERMAL RESISTANCE FOR QUALITY CONTROL OF SEMICONDUCTOR DEVICES

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received 9 Sep 83) pp 89-90

ZAKHARENKO, S.K. and SEMENOV, Yu.G.

[Abstract] A new method of measuring the internal thermal resistance of semiconductor devices is proposed for purposes of quality control in mass production. This method eliminates the temperature chamber with or without a calibration curve and the measurement of the temperature dependence of

heat-sensitive parameters in the existing methods. It involves comparative testing with an etalon device selected from a lot of 20-30 production samples and requires calculation of the mathematical expectation and the standard deviation of thermal resistance for the lot from the readings of thermal resistance between junction and case in each sample of the lot. The test circuit contains an 0-type galvanometer with an "accept-reject" scale, a thermocouple, three voltmeters, two ammeters, one microammeter, one single-pole two-position switch, one double-pole two-position switch, and nine resistors two of which are used for power equalizing. Measurements are made in the steady state, after a warm-up period (up to 15 min for power transistors). This method requires only half as many operations as the existing ones and a transistor is tested up to three times faster without sacrifice in precision. Figures 1; references: 3 Russian.
[73-2415]

UDC: 621.317.757

MEASUREMENT OF PARASITIC AMPLITUDE MODULATION IN FREQUENCY-MODULATION OSCILLATORS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian Vol 27, No 7, Jul 84 (manuscript received after revision 25 Apr 83) pp 85-86

VORONKOV, Yu. V.

[Abstract] A high-resolution device is described for measuring small parasitic amplitude modulation values in FM oscillators. A new approach is used in measuring small irregularities in the amplitude-frequency characteristics. A test signal is used which employs a complex modulation principle in conjunction with transformations of the test signal. These transformations are invariant to the measured quantity in order to prevent intrinsic irregularities in the amplitude-frequency characteristics from influencing the measured quantity. The operation of the device is described. The measurement resolution is analyzed, showing it possible to increase the resolution of measurements of the parasitic amplitude modulation coefficient as compared with the direct measurement method where a modulation meter is used. Figure 1; reference; 1 Russian.
[8-6900]

SEMIAUTOMATIC DIODE/TRANSISTOR TESTER

Moscow RADIO in Russian No 6, Jun 84 pp 17-18

SMIRNOV, A. Leningrad.

[Abstract] A semiautomatic test probe for transistors and diodes for home use is described. The tester can be used to check the serviceability of diodes and transistors, and to determine the structure and designation of the leads of transistors (emitter, collector, base) and diodes (anode and cathode). The device can also be used to measure the base current gain of a transistor connected in a common-emitter arrangement in the signal amplification mode. The tester is designed for checking low- and medium-power silicon transistors and diodes. The device consists of two independent sections: one for determining a component structure, and one for measuring current gain. The schematic diagram of both parts are traced and analyzed. The construction and adjustment of the device are explained. Figures 2.
[21-6900]

UDC 621.318.3.001.57

MATHEMATICAL MODEL OF ELECTROMAGNETIC SUSPENSION DEVICE WITH TWO CONTROL WINDINGS

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 (manuscript received 31 Jan 84) pp 73-74

VYSHKOV, Yu.D. and ZHUMAGAZIN, B.A.

[Abstract] A mathematical model is constructed for description of an electromagnetic suspension device with two variable air gaps (II-core and keeper pivoted at center) with two control windings. The corresponding system of four differential equations, namely two equations of motion and two equations of Kirchhoff's second law for the two-loop electric circuit, are linearized in partial derivatives. Energy state functions analogous to thermodynamic state functions are introduced for relating forces and moments to gap widths and currents. The magnetic energy and the flux linkages are calculated on this basis, for subsequent evaluation of the resultant electromagnetic force as a function of the two currents and the space rates of change of self- and mutual inductances. Figures 1; references: 2 Russian.
[79-2415]

UDC 624.97:551.594.221.001.4

MEASUREMENTS OF LIGHTNING CURRENTS IN OSTANKINO-TV TOWER

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 (manuscript received 9 Dec 83) pp 64-65

GORIN, B.N. and SHKILEV, A.V., Power Engineering Institute imemi G.M. Krzhizhanovskiy

[Abstract] In an on-going study of lightning impacts on the Ostankino TV tower, charges and currents were measured with two recording instruments, namely a cathode-ray oscillograph and a loop oscillograph, using a current shunt and a Rogowski loop (response time 0.3 μs, integration constant 0.01 s). A special lightning arrester for this purpose was insulated from the tip of the tower and connected through a high-voltage cable to the current shunt. Readings were taken at tower levels 47, 272, 381, 524, 533 m and at the tip 540 m above ground. The data have been evaluated statistically in terms of 90%, 50%, and 10% probability of strikes by ascending lightnings with either negative or bipolar discharge, characterized by magnitude and duration of charge pulses as well as maximum-duration current pulses. Figures 3; tables 2; references 3: 2 Russian, 1 Western.
[79-2415]

UDC 389.26:006.065:53.089.68

GOVERNMENT-CERTIFIED PRIMARY TIME AND FREQUENCY REFERENCE STANDARD

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 pp 25-26

YELKIN, G.A., PUSHKIN, S.B. and TATARENKOV, V.M.

[Abstract] A new primary time and frequency reference standard was certified by the Government in December 1983. It is the first one worldwide to include a radio-frequency optical-frequency bridge, which extends its range to 10^{14} Hz. Its four hydrogen frequency etalons are periodically checked by two cesium frequency etalons. Its working time scale selects automatically the best of three hydrogen time scale keepers, with another hydrogen and three cesium time scale keepers standing by. This working scale is compared with the TA (SU) national time scale and the UTC (SU) coordinated time scale. The internal comparator module contains a general-purpose minicomputer for programmed control of the etalons in real time, after preliminary analysis of time-interval and frequency-difference readings. The resolution of measurements is 10^{-9}s and 10^{-14} Hz over a 1000 s period ($2 \cdot 10^{-5}$ Hz over a 24 h period). The external comparator module contains a set of high-precision quantum clocks, receiver and recording equipment, the transmitter equipment for communication with secondary reference standards over meteor trails, terrestrial television channels, and radio navigation channels. The irreducible systematic error of this primary time and frequency reference standard is $2 \cdot 10^{-13}$, with a $5 \cdot 10^{-14}$rms deviation of readings and a $2 \cdot 10^{-14}$frequency instability over time periods from1000 s to 1 month. Figures 3; tables 1; references: 4 Russian.
[81-2415]

UDC 621.375.826:531.76.089.68

STATUS OF AND OUTLOOK FOR PRODUCING MEANS OF TRANSMITTING UNITS OF PLANE ANGLE, ANGULAR VELOCITY AND ACCELERATION WITH RING LASERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 pp 27-29

BLANTER, B.E., KRIVTSOV, Ye.P., LUK'YANOV, D.P., SINEL'NIKOV, A.Ye., FILATOV, Yu.V. and SHESTOPALOV, Yu.N.

[Abstract] The problem of laser goniometry arose as early as in 1965, in connection with the development of governmental reference standards of linear acceleration, whereupon it extended to the development of reference standards of plane angle and angular velocity. As a result of extensive studies at the All-Union Scientific-Research Institute of Metrology imeni D.I. Mendeleyev, a method and the first experimental test stand was completed in 1969 for checking discrete angle transducers dynamically with the aid of a ring laser. Further improvements have been made since then, the resolution of measurements now being within 0.6-0.8" and their rms deviation of the order of 0.1-0.01" with

momentary relative instability of the frequency not exceeding $(1-5)\cdot10^{-6}$". The "ring laser" method combines the universality and efficiency of the "constant angular velocity" method, while it eliminates the intracycle flutter in this otherwise very simple and stable method based on the direct proportionality of the angular displacement to the period of revolution and requiring only measurement of the time interval between two successive pulses. The transducer with a ring laser converts most accurately direct angle readings into electric signals, with attendant summation of beat signals produced by oppositely traveling waves during that interval between successive pulses. The performance of such a transducer is enhanced by addition of feedback for stabilization and of auxiliary other transducers for compensation of inevitable slow drift of the average angular velocity. The applications for such discrete laser goniometers extend now from gyro platform and turntables to production and calibration of instrument scales in manufacturing plants, typically of scales imprinted on metallic films and checked by direct recording of the interference patterns which waves of the ring laser produce. It can also be used for checking the position and the rotation of an object not kinematically coupled to the goniometer, with the aid of multifacet scanning prisms on a rotating platform. Figures 3; tables 2; references 20: 19 Russian, 1 Western (in Russian translation).
[81-2415]

UDC 621.3.014.13+[537.312.62:546.291]

OUTLOOK FOR REALIZATION OF PROXIMITY EFFECT AND JOSEPHSON DIRECT CURRENT IN HELIUM-2

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 pp 29-30

KIKNADZE, L.V., MAMALADZE, Yu.G. and CHEYSHVILI, O.D.

[Abstract] Basic concepts and physical mechanisms are developed for predicting the possibility of a proximity effect and a Josephson direct current in liquid helium under conditions of superfluidity in the normal-state region. The proximity effect, a consequence of a continuous wave function, has real meaning only when the coherence radius is much larger than interatomic distances. In liquid helium the conditions are unfavorable for this, inasmuch as there is no other characteristic distance here besides the interatomic one, except when the density of the superfluid component decreases while the coherence radius increases. Such a stimulation of quantum-mechanical coherence by suppression of superfluidity is examined closer, particularly its temperature dependence and pressure dependence. Thereupon the optimum conditions are established for direct-current superconduction through narrow channels or across microporous barriers, such a flow contributing to suppression of superfluidity. The critical or maximum possible Josephson current is calculated on the basis of these concepts. The underlying Ginzburg-Pitayevskiy theory is applied to two cases important from the standpoint of development of squids. The corresponding second-order cubic differential equation of equilibrium is formulated and solved numerically first for liquid helium in a gravitational field and then for the Josephson effect in a porous barrier between two free volumes of helium-2. Tables 1; references 23: 16 Russian, 7 Western.
[81-2415]

UDC 621.375.825.089.68:621.3.089.63

COMPARISON REFERENCE ETALON OF UNIT LASER RADIATION POWER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 pp 34-35

GOVOR, I.N., KUBAREV, A.V. and OZOLIN, V.V.

[Abstract] An etalon has been developed for comparing national secondary and governmental primary standards of laser radiation power. It contains, in addition to two reference instrument transducers operating by different principles and having different spectral characteristics, a laser source emitting at the 0.63 μm wavelength with high power stability, a recording instrument, a calibrating instrument, and signal shaping-checking circuits. The first reference transducer is a nonselective calorimetric one, a model of a black body consisting of two parallel conical copper shells with a 15° taper inserted one inside the other with two thin-film equivalent resistors between them. Its random error is $2 \cdot 10^{-4}$ and its systematic error is $4 \cdot 10^{-4}$. The second reference transducer is a precise photothermoelectric one for comparison of standards with similar spectral and space distributions of the radiation power, also for checking the performance of the calorimetric reference transducer. It consists of a photoelectric cell and a thermoelectric cell in thermal contact with one another through an integrating sphere on which they are placed not far apart. The radiation power can be measured either by the comparison method, with a very close equivalence of optic and electric signals under short-circuit conditions and reverse bias of the photoelectric cell, or independently by the parametric method involving absolute and relative readings of dissipated power. This reference transducer has a random error of $1.5 \cdot 10^{-4}$ and a systematic error of $3 \cdot 10^{-4}$. An auxiliary photodiode is provided for checking the radiation power level after it has stabilized. The instability of this etalon does not exceed $0.5 \cdot 10^{-4}$ during 1 hour. Figures 2; references 4: 3 Russian, 1 Western.
[81-2415]

UDC 621.373.5:621.317.7

MEASURING INTENSITY OF ELECTRIC FIELD PRODUCED BY ELECTROMAGNETIC PULSE WITH AID OF ACTIVE PROBES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 pp 50-51

BUYANOV, Yu.I., GOSTISHCHEV, E.A., PONOMAREV, V.B., SAMOYLIK, A.V. and YAGUSHKIN, N.I.

[Abstract] The performance of wideband active probes for measuring the electric field of a weak electromagnetic pulse within the Fraunhofer region of a strong radiation source is evaluated in terms of the proportionality factor between the electric field intensity and the voltage across the probe load, this factor also being the equivalent gauge length of such a probe.

Such a probe is usually made of a thin wire segment, placed above a metal surface perpendicular to it, and connected at the lower end through a cable to an impedance load. The current distribution along such a probe is calculated by the method of superposition of traveling waves, whereupon the equivalent gauge length is determined in terms of actual geometrical dimensions and electrical circuit parameters. For a capacitive load with a very large time constant this gauge length does not depend on the frequency of incoming signals. Moreover, in the usual case of a load capacitance much larger than the stray probe-to-earth capacitance, the load voltage is directly proportional to the quantity (h+ ½l)l (h- length of connecting cable in the field of the electromagnetic pulse, l- actual length of probe) and the probe behaves like a miniature antenna with top feed. The inductance of such probes is negligible within the 200-300 MHz range of radio frequencies and, consequently, measurements are hardly at all influenced by alternating magnetic fields. Figures 1; references: 3 Russian.
[81-2415]

UDC 539.1.074:53.08

SET OF TOOLS FOR CHECKING STATIONARY RADIATION INSPECTING EQUIPMENT WITHOUT DISASSEMBLY

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84 p 59

YANOVSKIY, A.P., YUDIN, M.F., URYAYEV, I.A., KUZNETSOV, Yu.V., BUKHONKO, M.I., POPRUZHKO, L.A. and FOMINYKH, V.I.

[Abstract] Three sets of tools are available for directly checking all stationary radiation control channels in nuclear power plants, without disassembly of the inspection equipment. Two of these sets include instruments for measuring the basic parameters of counters and photomultipliers, and they can also serve as generators of random pulses with repetition rates ranging from 0.1 to 10^4 Hz. There are such instruments in the third set, because any operative detection device has been found to be adequate for checking radiation control channels and, therefore, measurement of its parameters to be unnecessary. This set consists of three cylindrical $^{90}Sr+^{90}Y$ beta-radiation sources (50, 250, 350 MBk) with 15 aluminum diaphragms, $^{239}PuBe$ neutron sources (10^4-10^5 n/s) in protective jackets, ^{239}Pu alpha-radiation sources with diaphragms, adapters, counter simulators, and devices for checking gas and aerosol channels. All three sets operate from a 220 V - 50 Hz power line. They are completely radiation-safe, because conventional strong gamma sources, strong neutron fields, and radioactive gases or aerosols have been replaced, respectively, with weak beta sources, weak neutron sources, and solid alpha or beta sources. The sets have been certified, their error not exceeding ±20% in any range. References: 5 Russian.
[81-2415]

UDC 621.37/39

PECULIARITIES OF USING ROD ANTENNA FOR FIELD INTENSITY MEASUREMENT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 7, Jul 84, p 67

TISHCHENKO, V.A.

[Abstract] Rod antennas are used for measuring field and interference intensities, mainly because they have a circular radiation pattern and most readily respond to the vertical electric component of the electromagnetic field, that component being the dominant one near the earth in the frequency range up to 30 MHz. Such an antenna consists theoretically of a circular solid cylinder above and perpendicular to an idealized plane ground surface. A voltmeter bridging the clearance between the rod and that surface reads the voltage induced here by an electromagnetic field. For determination of the electric field intensity from these readings one must know the geometrical and electrical parameters of the rod. In practice the rod is mounted on an antenna base resting on a tripod, the latter standing on a "counterweighing" metal sheet. The essential difference between such a real antenna and the theoretical one is the large height of the rod above the metal surface. Consequently, such an antenna was calibrated against a ferrite antenna on an open pad in a stable field far from a radio station transmitting at the 170 kHz frequency. The receiver had a bandwidth of 0.2 kHz with the detector operating in the linear range and with the antenna amplifier disconnected. An FSM-6 meter was used for field and interference intensity measurements. The dependence of intensity readings on the height above the "counterweighing" ground surface was found to be linear for both antennas, steep for the rod antenna and much flatter for the ferrite antenna, a consequence of electrical asymmetry. This dependence in a uniform field introduces an indeterminacy into field intensity measurements. Because a rod antenna also responds to the electric field potential, it should be mounted at the height at which it has been calibrated for field intensity. When it has been calibrated against an equivalent theoretical antenna, then it should be mounted with the base directly on the "counterweighing" metal sheet. Nevertheless, applications for rod antennas are limited to uniform fields far from their sources. Figures 3; references: 1 Russian.
[81-2415]

SQUARE-PULSE GENERATOR

Moscow RADIO in Russian No 7, Jul 84 pp 28-30

TESLENKO, L., Kiev

[Abstract] A square-pulse generator is described which consists of a master oscillator and a kipp oscillator, the former controlling the pulse repetition period over the $2 \cdot 10^{-7}$-10 s range and the latter controlling the pulse duration period over the $5 \cdot 10^{-8}$-5 s range. This eliminates the problem of separately varying both, which is not possible in conventional square-pulse generators.

Addition of a polarity and amplitude converter with TTL microcircuits makes the generator a universal one with smooth amplitude regulation from zero to maximum, not limited by the low input impedance of TTL circuits and the consequently low resistance of the time-delaying variable resistor. Using a transistor switch in the master oscillator minimizes the effect of temperature and supply voltage fluctuations on the pulse characteristics. Such a generator can be used for tuning digital and other pulse devices with positive, negative, or bipolar supply voltage. Its characteristics are maximum pulse rise time 40 ns across a 100 pF load capacitor at the TTL output and 100 ns at the universal output, maximum pulse fall time 30 ns across a 100 pF load capacitor at the TTL output and 300 ns across the universal output, minimum load resistance across the TTL output for a 2.4 V pulse amplitude 240 ohm, maximum pulse amplitude across a 10 kohm load resistance at the universal output ±14 V, instability of pulse duration and period at the TTL output ±1.5% during ±10% voltage fluctuations, 0.1%/°C during temperature fluctuations, short-time intermittent instability 0.01%/min, maximum constant voltage during interval between pulses of same polarity at the universal output ±0.5 V. In addition to the two KT316B (or KT325, KT355, KT368) transistors in the two oscillators, there are four transistors in the polarity and amplitude converter. Alignment and tuneup of both oscillators requires an oscilloscope with a sweep variable from 0.1 μs/div to 1 s/div. The converter requires no tuning, possibly only matching of resistor and capacitor for minimum pulse rise and fall times. Figures 2; references: 4 Russian; editor's note.
[75-2415]

SIMPLE SWEEP FREQUENCY GENERATOR

Moscow RADIO in Russian No 7, Jul 84 pp 31-32

YEGOROV, I., Moscow

[Abstract] A sweep frequency generator is described whose center frequency can be varied from 10 kHz to 50 MHz, with seven 1-3 and 3-10 scales covering the 10 kHz - 30 MHz range and one 3-5 scale for the 30-50 MHz range. It consists of a tunable pulse generator with output voltage attenuator, a diode mixer for calibration, and a sawtooth-voltage generator as a source of frequency deviation. The pulse generator is a multivibrator with two emitter-coupled transistors and two diodes in the collector circuit of one. The first diode extends the tuning range and increases the frequency deviation, the second diode provides the necessary base bias to the other transistor. The pulse repetition rate is modulated either directly by the sweep voltage of the calibrating oscilloscope, this voltage being applied to the base of the transistor with the two diodes in its collector circuit through an additional attenuator or a special emitter follower, or by the separate sawtooth-voltage generator. The latter is a conventional two-transistor multivibrator and produces signals at any constant frequency within the 40-60 Hz range. The mixer receives unmodulated signals from a reference-frequency source and produces different-frequency signals which are sent through an RCR-filter to a calibrating oscilloscope. All components are mounted on two printed-circuit

boards of identical dimensions: one for the pulse generator, one for the sawtooth-voltage generator and the mixer. The assembly is double-shielded against stray pickup. It is used for debugging receivers, voltages lower than 1 μV being adequate for testing at frequencies up to 1 MHz. Because of its simplicity, it is not very precise in voltage and frequency settings so as to require, if necessary, additional calibration with null beats of standard signals. Figures 1; plus 3 figures in color by Yu. Andreyev.
[75-2415]

UDC: 621.317.78.029.6[083.76].089.6[47:439]

COMPARISON OF STANDARDS OF CEMA MEMBER COUNTRIES IN AREA OF MICROWAVE POWER MEASUREMENT IN WAVEGUIDE CIRCUITS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 64-66

MYL'NIKOV, A.V., PEREPELKIN, V.A., PETROVA, T.I., CHUYKO, V.G. (USSR), TODOROV, T., (NRB), GERGEY, A. (VNR), EL'KE, V. (GDR) and PETRASH, I. (CSSR)

[Abstract] This article discusses the results of a comparison of the national standards of the CEMA member countries in the area of measuring high-frequency and microwave electrical power with the CEMA standard. This is the State National Standard unit of power of electromagnetic oscillation in waveguide circuits at 2.59-37.5 GHz maintained at VNIIFTRI (All-Union Scientific-Research Institute of Physicotechnical and Radiotechnical Measurements). The first comparisons were made during 1975-1977 in a WR-90 23x10 mm waveguide at 10 GHz. Upon completion of this program, a second round of comparisons was made during 1979-1980. The means of measurement and the measurement procedures employed by the participating countries are outlined. It was found that the national standards of Bulgaria, Hungary, East Germany, the USSR and Czechoslovakia provide practically identical measurements. Inasmuch as the divergence of the results is 2-3 times smaller than the sum of the non-excluded systematic errors and comparison errors, the estimates of the errors of the national standards and CEMA standard can be made smaller in the future. The approach employed in 1980 is advantageous over traditional comparison methods using the 'star' system because it makes it possible to establish unity between standard measuring devices as well as between installations used to graduate standard of working devices against national standards. It has been decided to compare national standards with the CEMA standard biannually, employing the same program and procedures as in 1980. Tables 8; references: 2 Russian.
[88-6900]

UDC: 681.7.058.4

OPTICAL REFLECTOMETER FOR MULTIMODE FIBER LIGHTPIPES

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 30-32

VVEDENSKIY, Yu.V., GRYAZNOV, Yu.M., ZUYEV, A.B. and SPIRICHEV, Yu.Ye.

[Abstract] A simple optical reflectometer is described for localizing damage in lightpipes and measuring losses by the backscattering method. The structural diagram of the reflectometer, which utilizes no scarce optical components, is presented. The light pulse from a radiation source is fed through a directional coupler into the fiber being investigated. The reflected signals are extracted by the coupling device and input to a photodetector, after which they are displayed on a screen consisting of an R5-11 line irregularity meter. The optical source employed is a 32 DL-101 laser diode. A photomultiplier tube is employed as the photodetector. The optical system of the device is easy to fabricate and align, and employs no fiber-optic coupler. The possibility of working with any type of multimode fiber makes the device convenient for various research operations in fiber optics. Figures 2; references: 6 Russian (1 concerned with foreign radio electronics).
[88-6900]

UDC: 536.5:53.089.6:620.1

MULTICHANNEL MERCURY INSTRUMENTATION CURRENT PICK-OFFS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 34-35

D'YACHENKO, V.A. and TIMOFEYEV, A.N.

[Abstract] High-stability multichannel current pick-offs are described which consist of a collection of movable and stationary copper rings in which the current is transmitted from the rotating rings to the stationary ones through a liquid mercury conductor. The model TR24 instrumentation pick-off is described, in which the contact wires run through grooves between bearing insulators imbedded in and extending beyond the shaft and housing. The shaft is driven through a clutch from either side of the pick-off. The basic specifications of the TR24 current pick-off are presented. Figures 1; references 3 Russian.
[88-6900]

UDC: 681.3:681.121

LIQUID MASS FLOW RATE COMPUTER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 35-36

ANTONOV, N.N., TROYNIKOV, V.A. and SOTNIKOV, V.G.

[Abstract] A flow rate computer is proposed which implements an algorithm for dividing the volumetric flow rate, measured by a turbine flow meter, into the signal from the liquid flow velocity head meter signal (the device actually measures the axial force acting upon the turbine, rather than the velocity head). The block diagram of the device is presented and traced. The accuracy with which the numerator, denominator and their ratio are calculated and multiplied by the constant is limited by the corresponding digitization errors, which can be reduced to the required level by selecting the measurement interval. The choice of measurement interval is not effected by dispersion of the parameters of the transducers, which makes it possible to use the same interval for different transducers. The device permanently stores all transducer parameters in memory, which permits them to be corrected in accordance with test results. Figures 1; references: 2 Russian. [88-6900]

UDC: 389.14:53-59:629

METROLOGICAL SUPPORT FOR REMOTE TRANSPORT VEHICLE SPEEDOMETERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 38-39

KSENZENKO, A.Ya. and MATVEYEV, V.I.

[Abstract] The S-2M bench used to calibrate the Bar'yer-2 and Bar'yer remote speedometers, which operate in the 3-centimeter waveband, is described. The device can simulate the simultaneous movement of several vehicles and allows their speeds and distances to be programmed independently and accurately. This makes it possible to set up complicated calibration conditions, including the simulated passing of one vehicle by another. The range of simulated speeds is wider than that in similar devices, and a wide class of interfering factors can be simulated. High calibration accuracy is ensured by employing embedded self-calibration means which are controlled centrally with minimum operator intervention. The block diagram of the device is presented and analyzed; operating procedures are explained. The S-2M bench has been certified and recommended for commercial production. Figures 1; references 5 Russian. [88-6900]

UDC: 621.3.087.92:389.14:519.2

INDEPENDENTLY CALIBRATED RECTANGULAR VOLTAGE PHASE DIFFERENCE CONVERTERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 47-49

DYUZHIN, A.T., ILYUKOVICH, A.M. and KORSUNSKIY, I.Kh.-G.

[Abstract] Independent calibration means and methods are analyzed for medium-accuracy converters employed in test and measurement systems designed for difficult operating conditions. A circuit is described for independent calibration of devices which convert phase differences of sinusoidal oscillations to a fixed voltage. A converter is described which has a linear response and produces no error jumps throughout its entire working frequency range. The frequency component of the error is small, which makes it possible to minimize the number of calibration points, and thus to implement independent calibration simply. Figures 2; references: 6 Russian.
[88-6900]

UDC: 621.317.761:621.317.7.087.92

INDEPENDENTLY CALIBRATED FREQUENCY COMPARATOR BASED ON ANALOG RELATIVE FREQUENCY DIFFERENCE CONVERTER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 49-51

KORSUNSKIY, I.Kh.-G., DYUZHIN, A.T. and ILYUKOVICH, A.M.

[Abstract] A frequency comparator incorporating a circuit which converts a relative frequency difference to fixed voltage is described which can be used to calibrate pulse generators with continuous frequency tuning. The circuit diagram of the device is traced and explained. The frequency setting error is of the order of 0.1%. Frequency synthesizers in which the frequency measurement step is at least $10^{-3}f_{swp}$, as well as a number of other devices, can also be calibrated. The measurement process can be automated easily. Figures 2; references: 2 Russian.
[88-6900]

UDC: 621.317.36:621.3.019.3

IMPROVING ACCURACY OF MEASUREMENT OF PERIODIC TIME INTERVALS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 51-53

TYRSA, V.Ye.

[Abstract] Ways of reducing the methodical quantization error of digital instruments which pre-convert analog quantities to proportional repeating time intervals are investigated, using phase-shift measurement as an example. The phase-shift measurement error is mainly determined by errors in extracting the zero-crossing of the sinusoidal voltage and the quantization error. The accuracy with which a periodic time interval is measured can be increased by utilizing the coincidences of groups of pulses. The methodical error of the pulse-group coincidence method is 3-4 orders of magnitude smaller than that of other methods. A device to implement the method can be built entirely from commercially available components. A phase meter employing the pulse-group coincidence principle is described. Figures 3; references 4 Russian.
[88-6900]

UDC: 621.317

USE OF ELECTRONIC CODING-FREQUENCY METERS TO MEASURE PARAMETERS OF PULSED RADIO SIGNALS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 9, Sep 84 pp 53-54

POKHILYUK, A.P.

[Abstract] An expression is derived for calculating the combined additional error in measuring the frequency, period and frequency ratio of pulsed signals. The types of modifications which must be made to the structural diagram of the electronic counting frequency meter in order to facilitate measurement of the phase shift between radio pulses, the relative pulse duration and the carrier frequency of the modulating oscillation are described. It is found that the addition of a phase shift-carrier frequency converter to the electronic counting frequency meter makes it possible to measure the phase offset between two signals. This converter incorporates two amplifier-limiters and an exclusive OR gate, or a flip-flop converter. The use of a gating and envelope extraction device makes it possible to measure the parameters of the modulating pulse train: pulse and pause duration, period, carrier frequency, relative duration, etc. By updating commercially produced frequency meters it becomes possible, at low expense, to use them to measure the parameters of the carrier of pulsed radio signals with little additional error. Figures 1; tables 1; references: 7 Russian.
[88-6900]

UDC 621.391.266:621.383.4/5

EFFECT OF VARIANCE OF PHOTORECEIVER FREQUENCY CHARACTERISTICS ON CHARACTERISTICS OF MEASURING INSTRUMENTS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 6 Oct 83) pp 79-81

SHEMSHEDINOV, R.B. and KALEGANOV, V.F.

[Abstract] Because variance of the amplitude-frequency characteristic of photoreceivers in optoelectronic measuring in instruments is a major factor which destabilizes the performance of such instruments, the effect of this variance on signal detectability and resolution is evaluated for design purposes. The signal-to-noise ratio at the photoreceiver output is calculated for a photoreceiver which consists of a pulse signal amplifier and a detector, assuming that under certain conditions such as a changing ambient temperature its transfer function differs from the optimum one by a certain scale factor. The results for a Gaussian input signal indicate that the amplifier stage and the variance of its amplitude-frequency characteristic play the dominant role in degrading the instrument performance, the maximum signal-to-noise ratio being decreased and the signal waveform being changed in terms of shifting peaks and zero crossovers. Consequently, the point by which the signal arrival time is recorded also shifts and the signal time resolution becomes worse. Adaptive measures are recommended for compensating these effects of variance, such as temperature-sensitive automatic bandwidth regulation in the photoreceiver and automatic threshold regulation in the amplitude discriminator. Figures 2; references: 9 Russian.
[73-2415]

UDC 519.24

PARAMETERS OF AMPLITUDE-MODULATED SIGNAL UPON REFLECTIONS

Moscow RADIOTEKHNIKA in Russian No 8, Aug 84 (manuscript received, after completion, 11 Jul 83) pp 21-23

MERKISHIN, G.V.

[Abstract] Reflection of a coherent optical signal with amplitude modulation by two specularly reflecting surfaces is analyzed, such signals being used for measurement of distances between objects by interference methods. The parameters of the signal recorded by a square-law photodetector in the Fraunhofer region are calculated, assuming that the radiant flux intensity varies harmonically in time and that the reflection coefficient at the farther surface is equal to or smaller than the reflection coefficient at the nearer one. Both amplitude and phase of the fundamental modulation-frequency component of the photodetector current are found to depend on the location of the photodetector current are found to depend on the location of the photodetector in the plane of interference and on the distance between objects. Both this distance and the photodetector aperature are assumed to be

much smaller than the distance from the photodetector to the nearer object. Consequently, the maximum and minimum amplitudes and corresponding phases of the photodetector current carry information about the distance between two objects. In practice it is more expedient to measure the space-time parameters of the interference pattern with a linear array of low-sensitivity photodetectors rather than with a single one, which applies equally to the second and higher modulation-frequency harmonics of the photodetector current. Figures 4; references: 1 Western (in Russian translation).
[73-2415]

UDC: 621.385.69

COUPLED-CAVITY GYROTRONS WITH MODE CONVERSION

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 18 Jul 83) pp 1194-1201

ZAPEVALOV, V.Ye., MALYGIN, S.A., PAVEL'YEV, V.G. and TSIMRING, Sh.E., Institute of Applied Physics, USSR Academy of Sciences

[Abstract] The start-up characteristics and steady-state characteristics of gyrotrons incorporating coupled cavities and mode conversion are analyzed for the approximation of a fixed high-frequency field structure. The results are presented of experiments with gyrotrons at the second harmonic of the cyclotron frequency employing coupled cavities with modes $H_4,1,1$-$H_4,2,1$. Experiments with two types of coupled-cavity gyrotrons are described. The findings indicate that highly efficient gyrotrons employing coupled cavities and mode conversion can be implemented. The good agreement between the calculated and experimental characteristics indicate that the methods used to design the electrodynamic system are sufficiently accurate, and that the output parameters can be estimated with the approximation of a fixed high-frequency field structure. Figures 9; references 11: 10 Russian, 1 Western.
[97-6900]

UDC: 621.371.246:543.42.062

ABSORPTION OF RADIATION BY WATER VAPOR IN WINDOWS OF RELATIVE TRANSPARENCY OF 95-145 MICROMETER RANGE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 17 Aug 83) pp 1087-1095

SVERDLOV, B.A. and FURASHOV, N.I., Scientific-Research Radio Physics Institute

[Abstract] Absorption of radiation in pure water vapors in windows of transparency centered at λ = 97.1, 102.8, 105.6, 110.3, 118.9 and 142.3 μm is analyzed theoretically and measured spectrometrically. Data are presented to clarify the relationship between the analyzed and experimental values in

these windows for a water-air mixture. The measurements were performed on an echelette vacuum spectrometer employing a DRT-220 mercury lamp as the radiation source, and an OAP-5M pneumatic detector. Absorption in pure water vapor is compared with absorption in atmospheric water vapor. It is found that the experimental absorption exceeds the calculated value in pure water vapors for short-wave windows; the amount of difference is significantly greater for pure water vapor than for water plus air. The authors thank I.A. Rakov for computer calculations. Figures 1; tables 2; references 36: 18 Russian, 18 Western.
[97-6900]

UDC 621.314.261

MAGNETIC NOISE IN SINGLE-MACHINE ROTATING FREQUENCY CONVERTERS

Moscow ELEKTRICHESTVO in Russian No 9, Sep 84 (manuscript received 19 Jan 83) pp 38-43

POPOV, V.I., candidate of technical sciences, Gorkiy

[Abstract] The magnetic noise in rotating frequency converters with two magnetic fields in a common structure of an induction machine, each field having a different number of pole pairs corresponding to the frequency conversion ratio, is evaluated on the basis of harmonic analysis of the resultant magnetic induction in the air gap and the radial forces it generates. The rotor in small and medium-size machines is regarded as a solid cylinder so that the hollow stator cylinder remains the principal source of noise. Constraints on the numbers of stator slots and rotor slots are established so as to ensure minimum higher-frequency tooth noise and vibration, while structural requirements are stipulated for minimizing lower-frequency noise and vibration and avoiding resonances at any frequency. Typical design calculations for a three-phase motor-generator machine operating as 1:3 frequency converter are shown, including the amplitudes of design-controlled vibrations of magnetic origin. Figures 1; tables 4; references 7: 4 Russian, 3 Western (in Russian translation).
[74-2415]

PLAYBACK AMPLIFIER WITH HIGH INTERFERENCE IMMUNITY

Moscow RADIO in Russian No 7, Jul 84 p 46

DUDIK, V., Krasnogorsk (Moscow oblast)

[Abstract] A method of improving the interference immunity of a playback amplifier is proposed which has already been successfully applied to the "Mayaka-202" portable tape recorder. The input stage of the amplifier, consisting of a linear one-transistor circuit and an operational amplifier with frequency-dependent negative feedback, is placed separately from the next stages in the immediate vicinity of the playback head. It may even not be

necessary to shield the printed-circuit board which carries the amplifier input stage alone, shielding being necessary when all amplifier stages are mounted on one printed-circuit board. The interstage connecting cable is now 300 mm long but carries a 15-25 mV signal rather than a 0.3-0.5 mV one so that the relative pickup level is reduced by a factor equal to the transistor gain, while the cable to the playback head is now only 30-40 mm long so that the interference level drops by as much as 14 dB. The method is equally applicable to tape recorders with feedthrough channel and to plain tape phonographs. Figures 2.
[75-2415]

SIMPLE DETONATION METER

Moscow RADIO in Russian No 7, Jul 84 pp 40-42

SUKHOV, N., Kiev

[Abstract] A new instrument for measuring the detonation factor (sound distortion caused by parasitic frequency modulation within the 0.2-200 Hz range) has been built with only three transistors and two microcircuit chips, but it performs as well as the existing commercial 4I instrument according to GOST 11948-78 and CEMA ST 1359-78. It consists of an input amplifier with one transistor for the 3150±5% Hz measuring signal, an $R_{input}C$ high-pass filter, and RC low-pass filter, a Schmitt trigger, a differentiating capacitor which shapes pulses of contant duration determined by another RC circuit and with a repetition rate equal to the input signal frequency, a band-pass filter which extracts a pulse proportional to the frequency fluctuation of the input signal and forms the amplitude-frequency characteristic on the basis of subjective perception, three capacitors which determine the droop of the "weighting" characteristic (one if it is below 4 Hz and two if it above 4 Hz), and an operational amplifier with noninverted scaler and negative feedback. The negative signal appearing at the input of the operational amplifier is proportional to the detonation factor. After amplification, it proceeds to a quasi-peak voltmeter and also through an RC circuit of an oscilloscope. The voltmeter stage contains a KT315G transistor pair, a voltage dropping resistor, a current limiting resistor, two frequency matching RC networks, and a milliammeter. This instrument can operate from any unipolar 15±1 V d.c. source with a voltage ripple not exceeding 0.5 mV, drawing a maximum current of 25 mA. Its alignment and calibration require only a d.c. voltmeter with 10 kohm/V input resistance and a 3150 Hz sine-wave or square-wave generator. It can then be used for checking tape recorders with the use of test tapes already carrying phonograms of 3150 Hz signals. Three readings must be taken, at the beginning and at the end of a cassette or spool as well as somewhere in the middle, the highest reading being the conclusive one. The detonation factor in the test tape must be smaller than one third of the measured one. The instrument can also be used without test tapes, but the procedure is then more laborious. The proper scale must be selected, considering that each scale is nonlinear at the low end and its readings are too low there. The cause of excessive detonation can be established on the basis of its spectrum, by comparison of the peak frequency with the speed of the tape drive. Figures 2; references: 4 Russian.
[75-2415]

UDC: 621.317.37

THREE-MIRROR OPEN RESONATOR FOR MILLIMETER WAVE BAND

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 19 Jul 83) pp 775-781

VERTIY, A. A., POPENKO, N. A., POPKOV, Yu. P. and TARAPOV, S. I., Institute of Radiophysics and Electronics, Ukrainian SSR Academy of Sciences

[Abstract] The fixed characteristics of an open resonator having a prism with total internal reflection with dielectric specimens located nearby are investigated experimentally and theoretically (in a plane wave approximation). It is found that the determination of the special characteristics of a three-mirror open resonator in plane-wave approximation can be extended to the case of open resonators with spherical mirrors. The experimental and theoretical results agree to within 7% for an open resonator with a dielectric half-plane. It is found that the measurement sensitivity increases as the sighting parameter becomes smaller, but that the Q-factor of the oscillation drops off sharply when the dielectric half-plane is less than 0.3mm from the facet of the prism. Figures 6; references 6: 5 Russian, 1 Western.
[26-6900]

APPLICATION OF K176-SERIES MICROCIRCUITS

Moscow RADIO in Russian No 6, Jun 84 pp 32-35

ALEKSEYEV, S.

[Abstract] This article is the conclusion of a two-part presentation. The characteristics of the K176IYe18 microcircuit are analyzed by an example of an alarm clock in which the alarm is driven by a special audio signal generator provided by the microcircuit. The schematic diagram of the clock is presented and traced. The K176IYe17 microcircuit is also described: this device serves as a calendar which counts the days of the week and month. A schematic diagram showing the connection of the day-date microcircuit to the clock is presented. The admustment and setting of the clock and calendar are explained. Figures 4.
[21-6900]

UDC: 533.951

EXTRACTION OF SURFACE-WAVE ENERGY FROM PLASMA WAVEGUIDE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 9, Sep 84 (manuscript received 15 Aug 83) pp 1178-1184

ZAGINAYLOV, G.I., KONDRATENKO, A.N. and KUKLIN, V.M., Kharkov State University

[Abstract] This study examines the possiblity of extracting surface-wave energy from a plasma waveguide as the result of scattering on an abrupt irregularity in the permittivity. The scattered field is expressed in the general case through an infinite number of constants which satisfy two infinite systems of algebraic equations. Several important special cases capable of approximate solution are analyzed. It is found that the radiated power increases with an increase in the phase velocity of the incident wave in all cases considered; the maximum of the directivity pattern shifts to the region of small angles of inclination with respect to the axis of the waveguide. It is determined analytically that the power and directivity of the radiation for a thin layer can vary widely as a function of the frequency of the incident wave, the density of the plasma and the thickness of the layer. The findings may be helpful in radio electronics, plasma diagnosis and the development of surface-wave antennas based on plasma waveguides. Figures 2; references 16: 13 Russian, 3 Western.
[97-6900]

UDC: 532.542.4:534.29

TRANSFORMATION OF ACOUSTIC PERTURBATIONS INTO COHERENT STRUCTURES IN A TURBULENT WAKE BEHIND A PROFILE

Minsk INZHENERNO-FIZICHESKIY ZHURNAL in Russian Vol 47, No 4, Oct 84 (manuscript received 15 Jun 83) pp 533-536

BARDAKHANOV, S.P., KOZLOV, V.V. and YANENKO, N.N., (deceased), Institute of Theoretical and Applied Mechanics, Siberian Department, USSR Academy of Sciences

[Abstract] The influence of the acoustic field on the structure of a turbulent wake behind a profile with a sharp trailing edge is modeled experimentally. The work was done in a subsonic MT-324 wind tunnel, using a model whose cross section represented a symmetrical Zhukovskiy profile with a chord of 292 mm and a sharp trailing edge. The model was established at angles of attack of 0 and 8.5 degrees. Acoustic perturbations were created by a dynamic loudspeaker driven by a GZ-34 acoustic oscillator operating at f = 518 Hz. It is found that the acoustic oscillations in the turbulent wake are converted to coherent perturbations which, if the sound intensity is sufficient, can influence the integral flow characteristics, and can result in a significant change in the heat- and mass-transfer in the stream. This relationship must be taken into account when considering processes occurring in real turbine machines. Figures 4; references: 4 Russian.
[91-6900]

UDC 621.315.027.875.002.2

SOME CONCLUSIONS PERTAINING TO SUCCESSFUL OPERATION OF 750 kV ELECTRIC POWER TRANSMISSION LINES

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 pp 75-76

SHERENTSIS, A.N.

[Abstract] This is a discussion of the article by V.V. Yreshevich and L.F. Krivushkin in ELEKTRICHESTVO No 4, Apr 83. Certain omissions are pointed out, the most significant one being that successful operation of 750 kV electric power transmission lines was preceded by trial operation of an 87.5 km long

Konakovo-Moscow pilot utility line in 1967 and experimental operation of the Donbass-Dnepr first utility line since 1974. The total length of 750 kV lines was 3000 km by the beginning of 1981, and another 1200 km will be added shortly. Major problems are predicting the load, which has been overestimated for the Southern Power Grid (it is now 10-20% of the anticipated 1000 MW) and underestimated for the Leningrad-Moscow Power System (it is now 120% of the anticipated 750 MA). The consequences are both technical and economic, affecting the selection of conductor size, phase spacing, current-limiting shunt reactors, power-factor correcting capacitor banks, and since recently highly nonlinear resistors. To these problems must be added those of tower and support construction. Special problems exist in subarctic regions with permafrost soil. References: 7 Russian.
[79-2415]

UDC 621.3.014.38.001.24

IMPEDANCE OF GROUND TO EXPONENTIALLY VARYING CURRENT

Moscow ELEKTRICHESTVO in Russian No 8, Aug 84 (manuscript received 21 Dec 83) pp 65-67

KARAYEV, R.I., doctor of technical sciences, Moscow

[Abstract] The resistive component of the impedance of ground to the exponential transient component of short-circuit is calculated on the basis of Rudenberg's "trough" model and the corresponding differential field equations. The resulting second-order differential equation for the current density in ground, obtained by elimination of the magnetic field intensity, is transformed into a zeroth-order Bessel equation in the space coordinate only. Solution of the latter yields the modulus of current density proportional to the zeroth-order Neumann function of the space coordinate. The electric field intensity in ground divided by this current density yields the ground impedance, its resistance part being obtained from the Joule-effect power and the inductance in its reactive part being equal to the inductance calculated from the magnetic flux linkages. Figures 1; references 7: 5 Russian, 2 Western (in Russian translation).
[79-2415]

UDC: 621.371:621.378

INTENSITY FLUCTUATIONS OF FOCUSED LASER BEAM DURING REFLECTION IN TURBULENT ATMOSPHERE

Gorkiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian Vol 27, No 6, Jun 84 (manuscript received 11 Apr 83, after revision 1 Nov 83) pp 810-812

BORONOYEV, V. V., DASHINIMAYEV, V. D., ZANDANOVA, G. I., POPLAUKHIN, V. N. and TRUBACHEYEV, E. A., Institute of Natural Sciences, Buryat Branch, Siberian Department, USSR Academy of Sciences

[Abstract] The relative dispersion of intensity fluctuations in a reflected focused laser beam are investigated experimentally as a function of the diffraction parameter of a transmitter, the type of reflector and the intensity of the turbulence along the propagation path. The measurements were made on a uniform horizontal path 300-m long with simultaneous optical measurements of the structural characteristic of the fluctuations in the index of refraction of the air. It is found that the dispersion of the intensity fluctuations in a narrow beam exceeds the corresponding quantity in a wider beam, as is the case for a collimated beam. The saturation level of the relative dispersion of the intensity fluctuations of the reflected focused beam is close to the saturation level of relative dispersion in a spherical wave. This is apparently because a spherical wave reaches the receiver after the focused beam is reflected. The direct and reflected waves cover the entire distance from the transmitter to the receiver without passing through correlated atmospheric irregularities. The relative dispersion of the intensity fluctuations of a reflected focused laser beam is found to depend upon the diffraction parameter of the radiating aperture, as well as the type of reflector, as in the case for a collimated beam. The authors express gratefulness to V. A. Banakh and Ch. Ts. Tsydypov for attention to and support of the work. Figure 1; references 7: 5 Russian, 2 Western.
[26-6900]

UDC: 621.391.162

GAIN OF ACOUSTOOPTICAL DELAY LINE

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
Vol 27, No 7, Jul 84 (manuscript received 10 May 83) pp 28-32

PRESLENEV, L. N.

[Abstract] A generalized structural diagram is presented of an acousto-optical delay line which consists of a laser, a stage which generates several signal and heterodyne beams, a control stage, optical Fourier-transformation stages, an acoustical light modulator, a diffraction element and a photodetector. The circuit is analyzed with the assumption that the amplitude responses of the light modulator and photodetector are linear, and that the intensity of the heterodyne beam is fixed and much greater than the intensity of the diffraction (signal) beam. An expression is obtained for the gain of the delay line with the assumption that there are two optical beams in the output plane of the generating stage. The amplitude-frequency characteristics of an experimental prototype delay line having parameters analogous to those of the theoretical device are measured, and there is good agreement between the theoretical and experimental results. Figures 3; references 9: 6 Russian, 3 Western.
[8-6900]

UDC 621.313.17(049.3)

SPECIAL ELECTRICAL MACHINES (ENERGY SOURCES AND CONVERTERS)

Moscow ELEKTRICHESTVO in Russian No 9, Sep 84 pp 75-76

[Review of book by A.I. Bertinov (editor), D.A. But, S.A. Mizyurin, B.L. Aliyevskiy and N.V. Sineva, instructors at Moscow Institute of Aviation, "Energoizdat", Moscow, 1982]

KOPYLOV, I.P., doctor of technical sciences, professor, and IVANOVSMOLENSKIY, A.V., doctor of technical sciences, professor

[Abstract] The book covers the state of the art in electrical machinery for aero-space and ground applications, giving this broad subject a unique treatment which is both thorough and concise. Chapter 1 deals with the basic concepts of aero-space power requirements, Chapter 2 deals with the basic principles of electromechanical power conversion, Chapters 3 and 4 deal with the theory of electromechanical energy conversion on the basis of general Maxwell field equations, Chapters 5-8 deal with electrical machines in general and with specialty machines in particular, Chapters 9 and 10 deal with the physics of superconductivity followed by a.c. and d.c. superconductor-winding machines, Chapter 11 deals with unconventional sources of energy (solar, thermal, chemical) and its conversion to electric energy, Chapter 12 deals comprehensively with MHD processes and devices. Noteworthy are the appropriate omission of commutator machines and emphasis on brushless diode-switched ones. The entire subject matter is presented very scientifically, making full use of necessary and available mathematical tools. There are also a few deficiencies in the book, however. It does not cover all the basic types of electrical machines, especially those with all windings on the stator. Construction of coils is treated superficially and winding schemes are not shown at all. Electromechanical energy conversion is treated at two levels only, field theory and circuit theory, not adequate for many special cases. The statement on page 82 that "a model of an electrical machine with two orthogonal windings on the stator and two orthogonal windings on the rotor simulates almost any real machine in terms of electromagnetic torque and magnetic field distribution" is, therefore, disputable. The entire analysis in the book is based on the linear theory of energy conversion, magnetic nonlinearity being treated qualitatively only and the effect of saliency and teeth on the harmonic content of the magnetic field distribution and on the electromagnetic forces is not treated analytically at

all but only by empirical approximation. There are a few stylistic, substantive, and typographical errors. On the whole, however, the book is definitely a valuable contribution to the literature on general-purpose and special-purpose electrical machines.
[74-2415]

50TH ANNIVERSARY OF MEZHGORSVYAZ'STROY TRUST

Moscow ELEKTROSVYAZ' in Russian No 5, May 84 pp 1-4

RAVICH, IOSIF SOLOMONOVICH, USSR Deputy Ministry for Communications

[Abstract] The contribution of Mezhgorsvyaz'stroy--a specialized organization for the construction and installation of long-distance wire communications facilities--to the expansion of long-distance cable communications is outlined. The Trust was first organized in the 1930's, and was involved in constructing overhead lines carrying 3- and 12-channel telephone and telegraph systems. The Trust was involved in the construction of the world's then-longest overhead communications line in 1939, which ran from Moscow to Khabarovsk. The experience gained in this project was then put to use in other long lines, including Moscow-Tashkent and Moscow-Baku. The work performed by the Trust during the Great Patriotic War is reviewed. Recent work being performed by the Trust is outlined, including projects to modernize cable-laying equipment and the development of instrumentation. Most automatic long-distance telephone and telegraph exchanges now being installed are being handled by subdivisions of the Trust. The Trust's part in replacing K-1920 transmission systems with K-3600 systems is described. The contribution of Trust teams to the construction of major communications facilities for the 1980 Olympics is described. One of the most important problems now facing the Trust is that of training highly-qualified cable splicers, mechanical engineers and other critical personnel. Figures 4.
[46-6900]

END